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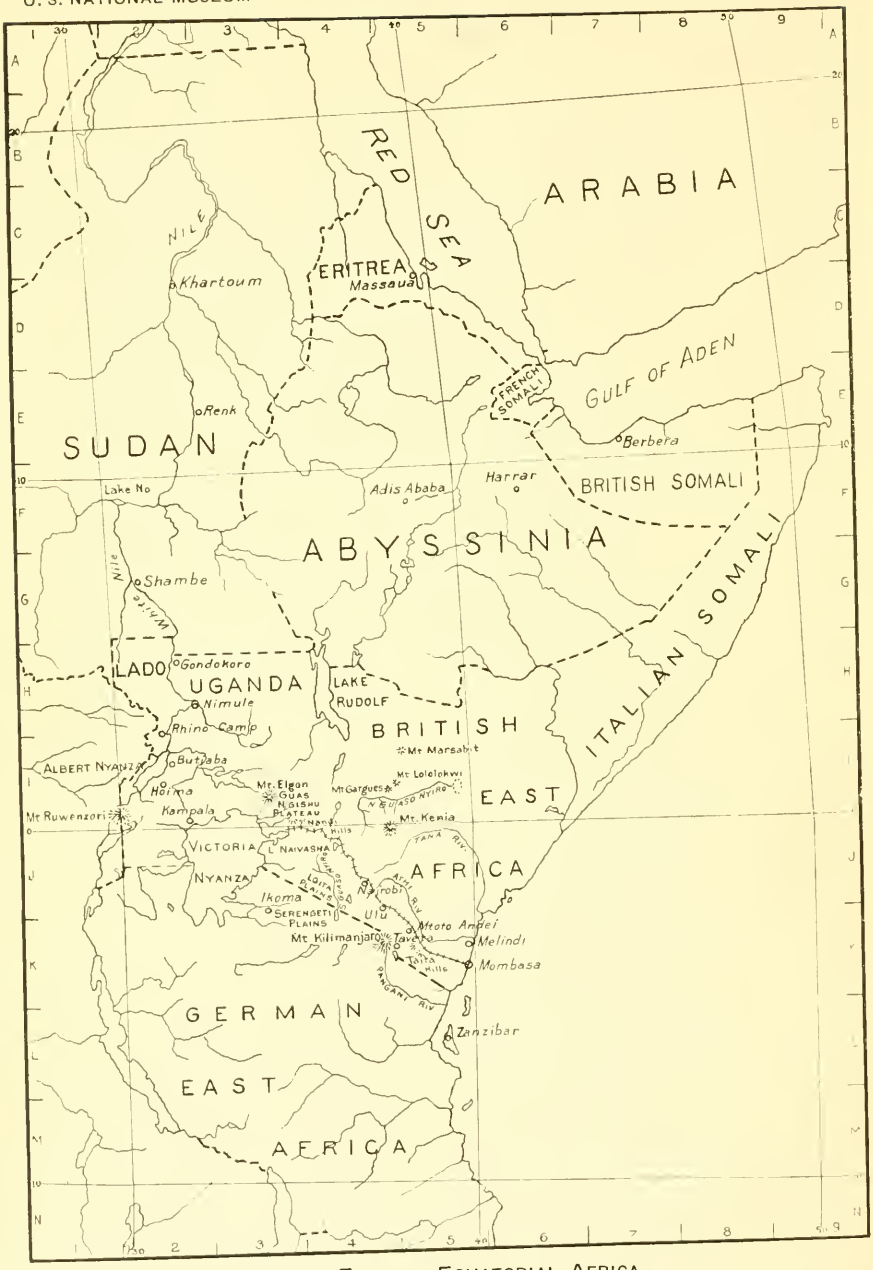


MAP OF EASTERN EQUATORIAL AFRICA.

FOR EXPLANATION OF PLATE SEE PAGE 19.

SMITHSONIAN INSTITUTION
UNITED STATES NATIONAL MUSEUM
**Bulletin 99**

# EAST AFRICAN MAMMALS IN THE UNITED STATES NATIONAL MUSEUM

PART I. INSECTIVORA, CHIROPTERA, AND CARNIVORA

SMITHSONIAN INSTITUTION
NATIONAL MUSEUM

BY

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WASHINGTON
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BULLETIN OF THE UNITED STATES NATIONAL MUSEUM.

## ADVERTISEMENT.

The scientific publications of the United States National Museum consist of two series, the *Proceedings* and the *Bulletins*.

The *Proceedings*, the first volume of which was issued in 1878, are intended primarily as a medium for the publication of original, and usually brief, papers based on the collections of the National Museum, presenting newly acquired facts in zoology, geology, and anthropology, including descriptions of new forms of animals, and revisions of limited groups. One or two volumes are issued annually and distributed to libraries and scientific organizations. A limited number of copies of each paper in pamphlet form, is distributed to specialists and others interested in the different subjects as soon as printed. The date of publication is recorded in the tables of contents of the volumes.

The *Bulletins*, the first of which was issued in 1875, consist of a series of separate publications comprising chiefly monographs of large zoological groups and other general systematic treatises (occasionally in several volumes), faunal works, reports of expeditions, and catalogues of type-specimens, special collections, etc. The majority of the volumes are octavos, but a quarto size has been adopted in a few instances in which large plates were regarded as indispensable.

Since 1902 a series of octavo volumes containing papers relating to the botanical collections of the Museum, and known as the *Contributions from the National Herbarium*, has been published as bulletins.

The present work forms No. 99 of the *Bulletin* series.

RICHARD RATHBUN,
*Assistant Secretary, Smithsonian Institution,*
*In charge of the United States National Museum.*

WASHINGTON, D. C., *June 12, 1918.*

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# EAST AFRICAN MAMMALS IN THE UNITED STATES NATIONAL MUSEUM.

## PART I. INSECTIVORA, CHIROPTERA, AND CARNIVORA.

By N. HOLLISTER,

*Superintendent, National Zoological Park, Washington.*

### INTRODUCTION.

Many special papers on the extensive collection of mammals from Eastern Equatorial Africa preserved in the United States National Museum have been published since the accumulation of this material began. These papers have been written by various specialists, and for the greater part consist of descriptions of new forms or reports on the collections of certain expeditions. No attempt has before been made to furnish a list of all the material in the museum, based on what amounts to monographic work in each group and careful identification of every specimen. Such a list is the basis of the proposed work of which the present section is the first part. It is hoped that the entire East African collection can be listed in a similar manner in a bulletin completed in three parts. Part I consists of the reports on the insectivorous mammals (Order Insectivora), the bats (Order Chiroptera), and the carnivores (Order Carnivora).

In addition to the lists of specimens carefully determined according to modern standards of systematic mammalogy, pertinent notes which seem worthy of preservation for future workers on the taxonomy and life histories of East African mammals are presented under the various generic, specific, and subspecific headings. What it is hoped will prove even more useful to systematic mammalogists are the extensive tables of measurements of individual specimens which have been made as a basis for preliminary work in each group, and which are published with the report.

The material in the collection, consisting almost wholly of well-prepared specimens with accurate data, has been assembled during many years from numerous sources. While many sections of the area treated are almost unrepresented in the collection by specimens of most groups, the mass of material accumulated from certain large areas far surpasses in numbers and importance that preserved in any other museum. This is the natural result of the efforts of the compe-

tent field naturalists who accompanied the larger and more extensive expeditions, and the foresight and energy of the museum authorities in the organization and maintenance of the work.

## GEOGRAPHICAL LIMITS.

East Africa, or rather Eastern Equatorial Africa, in the present connection includes all the area indicated in figure 1. This territory

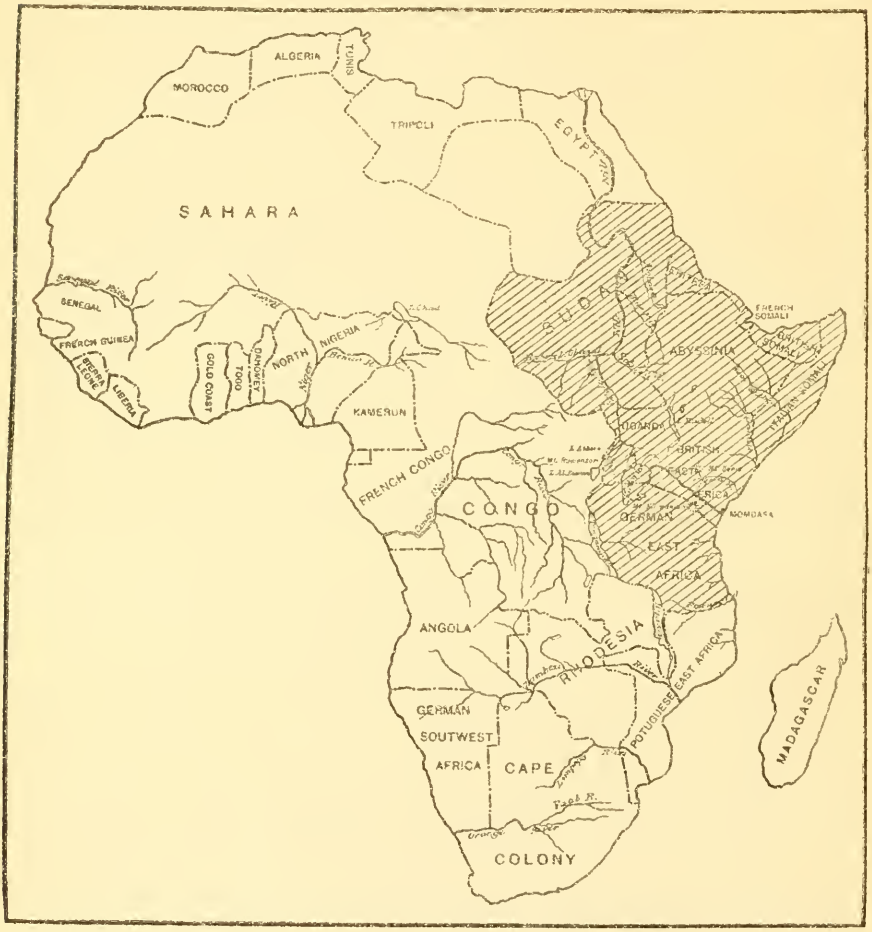


FIG. 1.—MAP OF AFRICA WITH SHADED AREA SHOWING THE REGION COVERED BY THIS REPORT.

is divided politically among several nations. In listing specimens the following major divisions are regularly used in the sequence indicated: Eritrea, French Somali, British Somali, Sudan, Abyssinia, Lado, Uganda, Italian Somali, British East Africa, Zanzibar, German East Africa.

## BRIEF HISTORICAL ACCOUNT OF THE COLLECTION.

In addition to minor accessions, often of great value, the bulk of the material in the East African mammal collections has been gathered by special zoological exploring expeditions, organized by patrons of the museum or by the Smithsonian Institution itself.

The first important mammal collection to reach the museum from eastern Africa was made by Dr. W. L. Abbott on his journey to Mount Kilimanjaro, 1887–1890, and was presented by him to the museum. It contained about 170 specimens, which were reported upon in 1892 by Dr. F. W. True.[1] Five new species were described at this time from Doctor Abbott's collection, one of which (*Cephalophus spadix*) has only recently been rediscovered.

Doctor Abbott left Zanzibar in the last days of November, 1887, and marched from Saadani, on the coast, to Kidudwe, about 90 miles inland, where he remained about five weeks. A side trip of two marches was made from here into the Nguru Mountains. He returned to Zanzibar in January, 1888. In February, 1888, he marched from Pangani, German East Africa, up the valley of the Ruva River (Pangani River) to Taveta. From Taveta numerous expeditions about the southern slopes of Kilimanjaro (Chaga), to Aruchu-wa-chini, and about the plains east of Kilimanjaro were made. A march down to the coast at Mombasa was made during the last days of January, 1889, and the next month he returned to Taveta. Trips were again made into Aruchu-wa-chini and to southeastern Chaga, and he then marched from Taveta northward to Kimangelia and to a swamp some 50 miles north of Kilimanjaro. The return to Taveta was made by way of the Kyulu Mountains (Ongolea Mountains on some maps). This was followed by a six months' stay in and about Moschi, in Chaga, south of Kilimanjaro, and the return to Mombasa in February, 1890. Altogether, many hundreds of miles of marches were made in the neighborhood of Kilimanjaro, and large collections of birds and other material, as well as of mammals, were made. The birds have been reported upon by Dr. H. C. Oberholser.[2]

In 1893 Doctor True published a short paper [3] describing a small collection of mammals made by William Astor Chanler and Lieut. Ludwig von Höhnel on the Tana River. This material was presented to the United States National Museum by the collectors.

During the summer of 1908, while on a sporting trip to the Guas Ngishu and Laikipia Plateaus, British East Africa, Mr. John Jay White preserved specimens of large mammals, about 30 in number, which he presented to the Museum. These were reported upon by

[1] Proc. U. S. Nat. Mus., vol. 15, pp. 445–480. 1892.

[2] Birds collected by Dr. W. L. Abbott in the Kilimanjaro region, East Africa, Proc. U. S. Nat. Mus., vol. 28, pp. 823–936. 1905.

[3] Proc. U. S. Nat. Mus., vol. 16, pp. 601–603. 1893

the present writer in 1910.[1] On subsequent trips Mr. White added to this collection.

A few mammals collected by the Hon. Hoffman Philip, minister resident and consul general, Adis Ababa, Abyssinia, were presented by him to the Museum in 1910.

The Hon. Alexander W. Weddell, American consul at Zanzibar, sent to the National Museum as a gift a few mammals collected by himself during the year 1911.

By far the most important contributions to the East African collection were made by two larger and more thoroughly equipped expeditions in the field from 1909 to 1912—the Smithsonian African Expedition and the Paul J. Rainey Expedition.

The Smithsonian African Expedition, which was first officially proposed by President Roosevelt in a letter to the Secretary of the Smithsonian Institution dated June 20, 1908,[2] was made possible through the generosity of friends of the Smithsonian Institution, who provided a special fund to pay for the outfitting and to meet the expenses of the naturalists who accompanied the expedition. The management of the expedition was under the direction of Col. Theodore Roosevelt, who defrayed all of his own expenses and those of his son, Mr. Kermit Roosevelt. The naturalists who accompanied him in the interests of the museum were Lieut. Col. Edgar A. Mearns, United States Army, retired; Mr. Edmund Heller; and Mr. J. Alden Loring. Doctor Mearns gave special attention to birds; Mr. Heller to the preservation of the larger mammals killed by Colonel Roosevelt and Kermit Roosevelt; and Mr. Loring devoted his time mainly to the collection of small mammals.

The party sailed from New York on March 23, 1909, landed in Mombasa on April 21, and journeyed over the Uganda railroad to Kapiti Plains, British East Africa, where a preliminary camp was established. Actual work commenced on the near by Athi Plains on April 24, when Colonel Roosevelt procured the first antelopes for the collection. Hunting and collecting were carried on in this general region until almost June 1, during which time the country east and northeast of Nairobi was well covered.

After several days' collecting at Nairobi the party left on the railroad for Kijabe, June 3. On June 5 the safari started for the Sotik. Collections were constantly made throughout the journey southward to the Loita Plains, the members of the expedition separating into groups and making camps at the most favorable localities for special work. On the return trip to the railroad, which was reached at Naivasha Station about August 1, considerable time was spent in work at Lake Naivasha. The safari left Naivasha for the north on

[1] Smithsonian Misc. Coll., vol. 56, No. 2, pp. 1-12. March 31, 1910.

[2] Report of the Secretary of the Smithsonian Institution for the year ending June 30, 1909, p. 8. 1909.

August 8, crossed the Naivasha Plains and the Aberdare Mountains, and reached Nyeri on August 11. Operations were carried on in this northern country until late in October. The party, as before, divided as seemed best to cover the ground thoroughly, and the Laikipia Plateau, Northern Guaso Nyiro, and Mount Kenia regions were very carefully worked.

The next region to be covered was the Guas Ngishu Plateau. Leaving Nairobi on October 25 the expedition moved westward over the railroad to Londiana. The next day the safari left Londiana and moved northward toward Ravine. The Elgeyo Escarpment and Guas Ngishu Plateau were worked in a manner similar to the other regions, and much collecting was done, especially along the Nzoia River. The return to the railroad was made in late November. During the first half of December much miscellaneous collecting was done by the members of the expedition at various points along the railway. This included a special trip by Kermit Roosevelt to the coast region below Mombasa for sable antelopes.

On December 18 the expedition left Nairobi on the railway for Victoria Nyanza. The lake was crossed to Entebbe and headquarters established at Kampala December 21. March was made across Uganda by way of Hoima to Butiaba, which was reached January 5, 1910. The journey down the Nile now began and the expedition reached Wadelai on January 8. From here a special trip into the Lado Enclave was made. The principal object of this trip was the white rhinoceros, but all the members of the expedition made the most of the opportunity and gathered large collections. The journey down the Nile, by boat and by land, was resumed on February 3, and collections were made at every opportunity. Gondokoro was reached on February 17. While the small mammal and bird collectors remained in the vicinity of Gondokoro Colonel Roosevelt led an expedition on a side trip across the Nile and inland from Rejaf after giant elands. The northward journey was resumed on February 28; collections were made at frequent intervals and at several especially important localities; and the party disbanded at Khartoum the latter part of March, 1910.

Colonel Roosevelt's preliminary report to the Secretary of the Smithsonian Institution, dated Khartoum, March 15, 1910, was as follows:[1]

I have the honor to report that the Smithsonian African expedition, which was intrusted to my charge, has now completed its work. Full reports will be made later by the three naturalists, Messrs. Mearns, Heller, and Loring. I send this preliminary statement to summarize what has been done; the figures given are substantially accurate, but they may have to be changed slightly in the final reports.

We landed in Mombasa on April 21, 1909, and reached Khartoum on March 14, 1910. On landing, we were joined by Messrs. R. J. Cuninghame and Leslie J. Tarlton; the

[1] Report of the Secretary of the Smithsonian Institution for the year ending June 30, 1910, pp. 10–11. 1910.

former was with us throughout our entire trip, the latter until we left East Africa, and both worked as zealously and efficiently for the success of the expedition as any other member thereof.

We spent eight months in British East Africa. We collected carefully in the various portions of the Athi and Kapiti plains, in the Sotik and around Lake Naivasha. Messrs. Mearns and Loring made a thorough biological survey of Mount Kenia, while the rest of the party skirted its western base, went to and up the Guaso Nyero and later visited the Uasin Gishu region and both sides of the Rift Valley. Messrs Kermit Roosevelt and Tarlton went to the Leikipia Plateau and Lake Hannington, and Dr. Mearns and Kermit Roosevelt made separate trips to the coast region near Mombasa. On December 19 the expedition left East Africa, crossed Uganda and went down the White Nile.

North of Wadelai we stopped and spent over three weeks in the Lado, and from Gondokoro Kermit Roosevelt and I again crossed in to the Lado, spending eight or ten days in the neighborhood of Rejaf. In Gondokoro we were met by the steamer which the Sirdar, with great courtesy, had put at out disposal. On the way to Khartoum we made collections in Lake No, and on the Bahr-el-Ghazal and Bahr-el-Zeraf. We owe our warmest thanks for the generous courtesy shown us and the aid freely given us, not only by the Sirdar, but by all the British officials in East Africa, Uganda, and the Sudan, and by the Belgian officials in the Lado; and this, of course, means that we are also indebted to the home governments of Egypt and Belgium.

On the trip Mr. Heller has prepared 1,020 specimens of mammals, the majority of large sizes; Mr. Loring has prepared 3,163, and Doctor Mearns, 714, a total of 4,897 mammals. Of birds, Doctor Mearns has prepared nearly 3,100; Mr. Loring, 899; and Mr. Heller about 50, a total of about 4,000 birds.

Of reptiles and batrachians, Messrs. Mearns, Loring, and Heller collected about 2,000.

Of fishes, about 500 were collected. Doctor Mearns collected marine fishes near Mombasa and fresh-water fishes elsewhere in British East Africa, and he and Cuninghame collected fishes in the White Nile. This makes in all of vertebrates: Mammals, 4,897; birds, about 4,000; reptiles and batrachians, about 2,000; fishes, about 500; total 11,397.

The invertebrates were collected carefully by Doctor Mearns, with some assistance from Messrs. Cuninghame and Kermit Roosevelt. A few marine shells were collected near Mombasa, and land and fresh-water shells throughout the regions visited, as well as crabs, beetles, millipeda, and other invertebrates.

Several thousand plants were collected throughout the regions visited by Doctor Mearns, who employed and trained for the work a Wunyamvezi named Makangarri, who soon learned how to make very good specimens and turned out an excellent man in every way.

Anthropological materials were gathered by Doctor Mearns, with some assistance from others. A collection was contributed by Major Ross, an American in the government service at Nairobi.

A complete account of the essential features of the expedition has been given by Colonel Roosevelt in his "African Game Trails."[1] Accounts of the larger mammals are given in manual form in Roosevelt and Heller's "Life-Histories of African Game Animals."[2] Numerous new species and subspecies of mammals collected on this expedition

[1] African Game Trails, New York and London, 1910.

[2] Life- Histories of African Game Animals, 2 vols., New York. 1914.

have been described by Mr. Heller in a series of special papers in the Smithsonian Miscellaneous Collections, 1909–1914. Other specialists have described forms in certain groups, mostly in the same serial publication.

The Paul J. Rainey Expedition to East Africa was planned by Mr. Rainey as a hunting and collecting trip, and he offered to present to the institution the natural history material obtained if the museum could send a trained field naturalist with his party. The services of Mr. Edmund Heller as a collector were again obtained, and the results of his work later fully justified the selection. All of the expenses were met by Mr. Rainey.

The collection made has been estimated to contain some 4,700 skins of mammals, together with many birds, reptiles, and other animals, making very valuable additions to the present African collections in the Museum. Nearly all of the material is from localities not covered by earlier expeditions, and some of it comes from points never before visited by naturalists. The collection includes the famous series of lions taken by Mr. Rainey with his American hounds, as described in his well-known lectures. There are also many specimens of different kinds of antelopes, including the hartebeests, wildebeestes, and waterbucks, as well as buffaloes, zebras, cheetahs, monkeys, and rodents. A few hippopotamus and rhinoceros skins and one elephant were also collected.[1]

The Rainey Expedition remained in the field about a year, having sailed from New York for Mombasa on February 18, 1911, and dispersing about February 15, 1912, at Nairobi. The region explored was mostly to the north and east of that covered by the Smithsonian African Expedition and included the country lying to the north of Mount Kenia toward the Abyssinian border. Important work also was done in the vicinity of Kavirondo Gulf; along the German East African border; in the Taita Hills; and along the coast region, near Mombasa.

Numerous new forms of mammals have been named in preliminary papers on the results of this expedition by Mr. Heller and others.

During the summer of 1914 Mr. Elton Clark and Mr. Thomas P. Lindsay, both of Boston, visited German East Africa on a hunting trip. They were fully equipped for collecting mammals, large and small. Their work unfortunately was cut short by the war, but a number of desirable specimens which reached the outside were presented to the Museum. These are mostly from the vicinity of Speke Gulf and from the Serengeti Plains, and are therefore of great interest to the Museum, as nothing had been previously received from that part of German East Africa.

[1] Report of the Secretary of the Smithsonian Institution for the year ending June 30, 1912, p. 8. 1912.

## SUMMARY OF SPECIMENS LISTED IN PART I.

The mammals of the orders Insectivora, Chiroptera, and Carnivora, listed in these pages, were received by the museum from expeditions and collectors as follows:

| | Insectivora. | Chiroptera. | Carnivora. | Totals. |
|---|---|---|---|---|
| Smithsonian African Expedition under the direction of Col. Theodore Roosevelt: | | | | |
| Col. Theodore Roosevelt | | | 16 | 16 |
| Kermit Roosevelt | | | 26 | 26 |
| Lieut. Col. Edgar A. Mearns, U. S. A | 20 | 63 | 36 | 119 |
| Edmund Heller | 51 | 74 | 34 | 159 |
| J. Alden Loring | 334 | 262 | 48 | 644 |
| W. N. McMillan | | | 6 | 6 |
| S. Medlicott | | 1 | | 1 |
| Paul J. Rainey African Expedition: | | | | |
| Paul J. Rainey | | | 79 | 79 |
| Edmund Heller | 321 | 117 | 207 | 645 |
| Dr. M. E. Johnston | | | 11 | 11 |
| A. J. Klein | | | 4 | 4 |
| Dr. S. L. Hinde | | | 1 | 1 |
| Dr. W. L. Abbott | 3 | 3 | 22 | 28 |
| H. J. A. Turner | 5 | 14 | 3 | 22 |
| John Jay White | | | 13 | 13 |
| Hon. Alexander W. Weddell | | 10 | | 10 |
| William Astor Chanler | | 6 | | 6 |
| A. B. Percival | 4 | 1 | | 5 |
| Elton Clark | | | 4 | 4 |
| D. V. Raggazzi | | 4 | | 4 |
| G. Schrader | | | 4 | 4 |
| Hon. Hoffman Philip | | | 3 | 3 |
| Hon. N. Charles Rothschild | | 3 | | 3 |
| Thomas P. Lindsay | | | 2 | 2 |
| Viaggio de L. Ruspoli | | 2 | | 2 |
| National Zoological Park (collector unknown) | | | 2 | 2 |
| E. S. Cunningham | | | 2 | 2 |
| R. E. Dent | | 1 | 1 | 2 |
| James L. Clark | 1 | | | 1 |
| Emperor Menelik | | | 1 | 1 |
| Sir Francis Reginald Wingate | | | 1 | 1 |
| R. B. Woosnam | | 1 | | 1 |
| Capt. H. G. C. Swayne | | | 1 | 1 |
| R. A. Gross | | | 1 | 1 |
| G. E. Dobson (received from) | | 1 | | 1 |
| Mus. Civ. di Storia Nat. Genoa (received from) | | 1 | | 1 |
| British Museum (received from; collected by—Salmin) | | 1 | | 1 |
| W. F. H. Rosenberg (received from) | | | 1 | 1 |
| | 739 | 565 | 529 | 1,833 |

### SUMMARY.

| | |
|---|---|
| Insectivores, bats, and carnivores from Smithsonian African Expedition | 971 |
| Insectivores, bats, and carnivores from Paul J. Rainey Expedition | 740 |
| Insectivores, bats, and carnivores from miscellaneous sources | 122 |
| Total in the United States National Museum | 1,833 |

There are included in the East African collections of insectivores, bats, and carnivores 64 type-specimens. Of the 64 new forms 2 were described by Gerrit S. Miller, jr.; 14 by N. Hollister; and 48 by Edmund Heller. They comprise 26 insectivores, 7 bats, and 31 carnivores.

Of these 64 described forms, 57 are recognized as valid species or subspecies in the present paper.

## LIST OF LOCALITIES.

A list of all the localities from which National Museum specimens of insectivores, bats, and carnivores are mentioned in this report is given below, with index references to the accompanying map. (Plate 1.) Only a few of these places are marked on the map itself, but it will not be difficult to place with reasonable accuracy each locality mentioned. Maps of this region do not agree in essential details. A large collection of maps of all degrees of accuracy, including official sectional maps, as well as the collectors' catalogues and journals, have been used in this work. It is believed that each locality has been defined with fair accuracy, but slight mistakes have no doubt been made in the original manuscript map and therefore in the following dictionary. For general purposes this will not cause much annoyance, as the variations can be only of a comparatively few miles at the most, and amount to little on so small a map. There has never been any doubt about the approximate location of a given place, but owing to the great disagreement among maps, even of the better sort, it has been almost impossible to determine the localities with precision.

Aberdare Mountains—A range of mountains about half way between Lake Naivasha and Mount Kenia. Summits said to to be 11,000–12,000 feet. J 4.

Adis Ababa—Capital city of Abyssinia, situated near the geographical center of that country. Also written Addis Ababa and Addis Abeba. F 5.

Agate's—On the Southern Guaso Nyiro near the eastern edge of Loita Plains. J 4.

Archer's Post—On the Northern Guaso Nyiro near the mouth of the Lakiundu River, north of Mount Kenia. I 5.

Aruscha Wa-cini, or Aruscha-wa-chini—South of Mount Kilimanjaro, in German East Africa, near the upper Pangani River. K 4.

Athi Plains—North and east of Nairobi. J 4.

Athi River—See Athi Station, which is on Athi River. J 4.

Athi Station—On the Uganda railway, 16 miles southeast of Nairobi. It is also called Athi River. Altitude, 4,950 feet. J 4.

Bargunett River—A southern tributary of the Northern Guaso Nyiro, near the Meru Road, west of Mount Kenia. J 4.

Berbera—Seaport of British Somaliland, on the Gulf of Aden. E 7.

Bor—On the east bank of the Bahr el Jebel in Mongalla Province, Sudan, between Shambe and Gondokoro. G 2.

Burgunett River—See Bargunett River. J 4.

Butiaba—On the northeast shore of Albert Nyanza in Unyoro, Uganda. I 2.

Changamwe—Station on the railroad 6 miles inland from Mombasa. Altitude, 180 feet. K 5.

El Dueim—On the Bahr el Abiad (White Nile) somewhat more than 100 miles south of Khartoum, Sudan. D 2.

Engare Narok River—A tributary of the Southern Guaso Nyiro. On the west side of the Mau Escarpment midway between the Uganda Railroad and the border of German East Africa. J 4.

Engare Ndare River—A southern tributary of the Northern Guaso Nyiro, north of Mount Kenia. I 4.

Engarro Naroke River—See Engare Narok River. J 4.

Fort Hall—About midway between Nairobi and Mount Kenia. J 4

Fort Hoima—See Hoima. I 2.

Fort Kampala—See Kampala. I 2.

Gondokoro—On the east bank of the Bahr el Jebel in extreme northwestern Uganda. H 2.

Guas Ngishu Boma—At the eastern edge of the Guas Ngishu Plateau near the Elgeyo Escarpment and north of Ravine Station. I 4.

Guas Ngishu Plateau—South and east of Mount Elgon, west of the Elgeyo Escarpment, and north of the Nandi Hills. Drained by the upper waters of the Nzoia River. I 3–4.

Habesch—In northern Eritrea; also the Abyssinian Empire. C 4–5.

Harrar—In eastern Abyssinia. F 6.

Hoima—In Unyoro, western Uganda, not far from the eastern shore of Albert Nyanza. I 2.

Ikoma—In northern German East Africa, east of Speke Gulf, Victoria Nyanza. J 3.

Isiola River—A southern affluent of the Northern Guaso Nyiro, north of Mount Kenia, and west from the Lakiundu River. I 4–5.

Juja Farm—W. N. McMillan's place on the Athi Plains, about 23 miles northeast of Nairobi. J 4.

Kabalolot Hill—In the Sotik, west of Loita Plains and near the border of German East Africa. Headwaters of the Amala River. J 3–4.

Kabula Muliro—On the road about midway between Kampala and Hoima, Uganda, between Albert Nyanza and Victoria Nyanza. I 2.

Kaimosi—On the Lukosa River just north of the Equator and north of Port Florence, the western terminus of the railway in Kavirondo. I 3.

Kakumega—Just north of the Equator near Port Florence, the end of the railway in Kavirondo, Kisumu Province, northeast of Victoria Nyanza. I 3.

Kakumega River—See Kakumega. I 3.

Kamiti Farm—Ranch owned by H. H. Heatley on the Athi Plains. J 4.

Kampala—Fort Kampala, or Mengo, just north of Entebbe, Uganda, and near the northwestern edge of Victoria Nyanza. I 2.

Kampi Moto—Twenty miles north of Nakuru, a station on the railway northwest from Lake Naivasha. I–J 4.

Kampiya bibi—On the Guas Ngishu Plateau. I 3–4.

Kapiti—See Kapiti Plains. J 4.

Kapiti Plains—A station, also called Kapiti, or Kapiti Station, on the railway 29 miles southeast of Nairobi and 288 miles from Mombasa. Altitude, 5,350 feet. J 4.

Kara River, or Kara Water—On the Marsabit Road north of Mount Lololokwi. I 5.

Kasorongai River—On the west side of Mount Kenia and north of Nyeri. J 4.

Khartoum—On the White Nile in Sudan. D 2.

Kibabe—In the Nandi Hills, Kisumu Province, British East Africa, just north of the Equator and northeast from Victoria Nyanza. I 3.

KIJABE—A station on the Uganda railway in British East Africa between Nairobi and Lake Naivasha. Altitude, 6,790 feet. J 4.

KIJABE STATION—See Kijabe. J 4.

KILIMA KUI—In Ulu, British East Africa, northeast of Ulu Station on the railway and south of Machakos. J 4–5.

KILIMANJARO—See Mount Kilimanjaro. K 4.

KIRIBA—On the east bank of the Bahr el Jebel, 10 miles south of Gondokoro, in extreme northwestern Uganda. Also called Kiriba Village. H 2.

KISII DISTRICT—In western British East Africa, near Kavirondo Bay. J 3.

KISIMBIRI—North of Kampala and Entebbe, near the northwest corner of Victoria Nyanza, Uganda. Sometimes written Kisimbili. I 2.

KISUMU—A village on Ugowe Bay, northeastern shore of Victoria Nyanza and near Port Florence. Also a province of western British East Africa bordering on Victoria Nyanza. J 3.

KITANGA—Sir Alfred Pease's farm in the Mwa Hills on the Athi Plains, near Nairobi and Athi Station. J 4.

KOYA WATER—On the Marsabit Road north of Mount Lololokwi, British East Africa. I 5.

LAIKIPIA—On the western edge of the Laikipia Plateau southeast of Lake Baringo. I 4.

LAIKIPIA PLAINS—See Laikipia Plateau. I 4.

LAIKIPIA PLATEAU—Northwest from Mount Kenia and north of the Aberdare Mountains. I 4.

LAKE NAIVASHA—A lake and station, on the railway across British East Africa, 391 miles from Mombasa and almost 200 miles from Port Florence. The altitude of the railway station is given as 6,230 feet. J 4.

LAKE NO—In southern central Sudan, at junction of the Bahr el Ghazal, Bahr el Abiad, and Bahr el Jebel. F 2.

LAKIUNDU RIVER—Rises in the Jambeni Mountains, northeast of Mount Kenia, and flows west and north into the Northern Guaso Nyiro at Archer's Post. I 5.

LEDGUS—On the east bank of the Bahr el Jebel, between Gondokoro and Nimule, northwestern Uganda. H 2–3.

LESIWERU RIVER—One of the numerous small streams flowing northwest from Mount Kenia and crossed by the Meru Road. I 4.

LIME SPRINGS—Near the eastern edge of the Loita Plains, not far from the Southern Guaso Nyiro River. J 4.

LOITA PLAINS—Near the German East African border in southwestern British East Africa, west of the Rift Valley and the Southern Guaso Nyiro River. J 4.

LONGAYA WATER—On the Marsabit Road north of Mount Lololokwi. I 5.

LOROGHI MOUNTAINS—About midway between Mount Kenia and the southern end of Lake Rudolf. I 4.

LUKOSA RIVER—South of the Nzoia River on Guas Ngishu Plateau, flowing into Victoria Nyanza. Also called Lukos River and Yala River. I 3.

MACHAKOS ROAD—A railway station between Kiu and Kapiti Plains stations; the road leading from station to town of Machakos, north of the railway and southeast of Nairobi. J 4–5.

MAJI-YA-CHUMVI—A station on the railroad 35 miles from Mombasa; altitude, 570 feet. K 5.

MARIAKANI—A station on the railroad 26 miles from Mombasa. K 5.

MARSABIT ROAD—The road leading to Mount Marsabit, north of the Northern Guaso Nyiro River. I 5.

MASSAUA—Port on the Red Sea, Eritrea. C–D 5.

MAU HILLS—The Mau Escarpment. In this connection the specimens labeled Mau Hills came from a point 15 miles north of Ravine Station. I 4.

Mayo River—One of the affluent streams of the Northern Guaso Nyiro rising in the Aberdare Mountains. J 4.

Mazeras—Station on the railroad 16 miles from Mombasa; altitude, 530 feet. K 5.

Mbalageti River—In northern German East Africa; rises at the western edge of the Serengeti Plains and flows westward into Speke Gulf, Victoria Nyanza. J–K 3.

Melindi—On the coast of British East Africa, north of Mombasa, at the mouth of the Sabaki River. Also written Malinda. K 5.

Merelle River, or Merelle Water—On the Marsabit Road, about midway between the northern Guaso Nyiro River and Mount Marsabit. I 5.

Meru—Just north of Mount Kenia. I–J 4–5.

Meru Road—Across the Laikipia Plateau to Meru, north of Kenia. I–J 4.

Mnyouri Jardin—On the east bank of the Bahr el Jebel, between Gondokoro and Nimule, and just south of Ledgus, northwest Uganda. H 2.

Mobuku Valley—Southeast side of Mount Ruwenzori, between Albert Nyanza and Albert Edward Nyanza, western Uganda. I 1–2.

Mongalla—On the east side of the Bahr el Jebel in extreme southern Sudan, a few miles north of Gondokoro. G–H 2.

Mount Gargues—In the Mathews Range, north of Mount Kenia and southeast of Lake Rudolf. Summit said to be 8,800 feet altitude. Also written Mount Uaragess. I 4–5.

Mount Kenia—A high peak in central British East Africa, almost directly on the Equator. Altitude given on recent maps from 17,200 feet to 18,620 feet. Timberline is about 13,000 feet. I–J 4–5.

Mount Kenia Forest Station—A forest station on the west side of Mount Kenia at 7,500 feet altitude. I–J 4–5.

Mount Kilimanjaro—A mountain on the border between British and German East Africa, about 175 miles from the coast. Altitude 19,780 feet. K 4.

Mount Lolololkwi—An isolated mountain east of the Mathews Range, about midway between Mount Kenia and Mount Marsabit, British East Africa. I 4–5.

Mount Mbololo—In the Taita Hills, about midway between Kilimanjaro and the coast. Summit 4,400 feet. Sometimes written Mbululu. K 5.

Mount Nyiro—A short distance south of Lake Rudolf and northeast of Lake Sugota. I 4.

Mount Sagalla—In the southern Taita Hills, about midway in a line between Kilimanjaro and Mombasa. K 5.

Mount Uaragess—See Mount Gargues. I 4–5.

Mount Umengo—In the Taita Hills, west of Ndi, and between Taveta and the railway, British East Africa. K 5.

Mtheka Hill—Near the railway station of Ulu, which is 276 miles from Mombasa and about 50 miles from Nairobi. J–K 4.

Mtoto Andei—A station on the railway 165 miles inland from the coast and about midway between Mombasa and Nairobi. Altitude 2,500 feet. K 5.

Mubuku Valley, East Ruwenzori—See Mobuku Valley. I 1–2.

Nairobi—Capital of Ukamba Province, British East Africa, 327 miles from Mombasa and about 260 miles from Port Florence by rail. Altitude 5,450 feet. J 4.

Nairobi River—In this connection one of the headwaters of the Tana River on the southwest side of Mount Kenia. There is a Nairobi River near Nairobi. J 4.

Naivasha—A station on the Uganda railway near Lake Naivasha. Altitude 6,230 feet. J 4.

Naivasha Plains—Northeast of Lake Naivasha. J 4.

Naivasha Station—See Naivasha and Lake Naivasha. J 4.

Nakutichu River—On the Naivasha Plains. J 4.

Ndi—In the Taita Hills, between Taveta and the railroad. K 5.

Neuman's Boma—On the north bank of the Northern Guaso Nyiro River nearly opposite the mouth of the Isiola. Also called Neuman's Camp. Almost directly north from Mount Kenia about 60 miles. I 4–5.

Ngare Nyuki or Nyuki River—One of the headwaters of the Northern Guaso Nyiro, northwest of Mount Kenia. I 4.

N'garri Narok River—See Engare Narok River. J 4.

Nimule—On the east bank of the Bahr el Jebel, about midway between Albert Nyanza and the Sudan border, in northwestern Uganda. H 2.

Njoro Osolali, or Njoro O Solali—In the Sotik, southwestern British East Africa. J 4.

Nkyanuna—A few miles northwest from Fort Kampala, Uganda, on the trail to Hoima. I 2.

North Creek—On the northern slopes of Mount Gargues, Mathews Range, British East Africa. I 4–5.

Northern Guaso Nyiro—The region drained by the Northern Guaso Nyiro River, north of Mount Kenia. I 4–5.

Northern Guaso Nyiro River—Formed by numerous streams in the Aberdares, northern slopes of Mount Kenia, and Mathews Range; and flowing eastward at least to the Lorian Swamp. I 4–5.

North Loroghi—See Loroghi Mountains. I 4.

Nyama Nyango—In the Northern Guaso Nyiro. I 4.

Nyangnori—In the Nandi Hills, a short distance northeast from Port Florence, British East Africa. I–J 3.

Nyeri—On the southwestern side of Mount Kenia at 6,200 feet. J 4.

Nyuki River—See Ngare Nyuki. I 4.

Nzoia River—Drains the Guas Ngishu Plateau and empties into Victoria Nyanza a few miles north of the Equator. I 3.

Ogaden—District in extreme eastern Abyssinia, near British and Italian Somaliland. F–G 8.

Olarakeri—In the Sotik, southwestern British East Africa. J 4.

Oljoro O Nyon River—West side of the Mau Escarpment, about 35 miles southwest of Lake Naivasha. J 4.

Omdurman—In Sudan, on the west bank of the White Nile almost opposite from Khartoum. C–D 2.

Oni—A small stream called also the Omboni River, one of the headwaters of the Tana south of Mount Kenia. J 4–5.

Orr Valley—At Mount Nyiro, near the southern end of Lake Rudolf. I 4.

Quoy, or Quoy Water—On the Marsabit Road northeast from Mount Lololokwi. I 5.

Renk—On the Bahr el Abiad (White Nile) at about 12° north latitude, Sudan. E 3.

Rhino Camp—Colonel Roosevelt's base camp on the west bank of the Nile in extreme southern Lado Enclave at 2° 55′ north. H–I 2.

Rumathe River, or Rumathe Water—A small tributary of the Northern Guaso Nyiro. I 4–5.

Ruwenzori East—Eastern slopes of Mount Ruwenzori. I 2.

Ruwenzori Mountains—In extreme western Uganda just north of Albert Edward Nyanza; rise to an altitude of about 20,000 feet. I 1–2.

Saaita—Seaport of Eritrea, south of Massaua. D 5.

Serengeti Plains—In north central German East Africa south of Loita Plains and west of Lake Natron. The western edge is about 75 miles east of Speke Gulf, Victoria Nyanza. J–K 3–4.

Shambe—On the Bahr el Jebel, Sudan, about midway between Gondokoro and Lake No. G 2.

Shendi—On the Nile, north central Sudan, north of Khartoum. C 3.

Sir Alfred Pease's Farm—See Kitanga. J 4.

Sirgoit—Near the Elgeyo Escarpment, eastern edge of Guas Ngishu Plateau. I 4.

Sirgoit Lake—Near the Elgeyo Escarpment, eastern edge of Guas Ngishu Plateau, northwest from Sirgoit. I 4.

Sotik—District in southwestern British East Africa between the Mau Escarpment and Kavirondo Bay. J 3–4.

Southern Guaso Nyiro—Region of the Southern Guaso Nyiro River, southwestern British East Africa. J 4.

Southern Guaso Nyiro River—Southwestern British East Africa and northern German East Africa on the west side of the Rift Valley. J 4.

Suksukki River—A small stream which connects Lake Zwai with Lake Hora Schalo, south of Adis Ababa, Abyssinia. 7°–8° north; 38°–39° east; altitude 4,500–5,000 feet. F–G 5.

Suswa Plain—South of Lake Naivasha and west of Kikuyu. J 4.

Taita Hills, or Taiti Mountains—About midway between Kilimanjaro and the coast in southeastern British East Africa. K 5.

Tana River—Heads in the Aberdares and southern side of Kenia and flows into the Indian Ocean something over 100 miles north of Mombasa. J 5.

Taveta—In British East Africa near the German East African border southeast of Mount Kilimanjaro. K 4–5.

Telek River—North of Loita Plains in southwestern British East Africa. J 3–4.

Thika River—One of the affluents of the Tana River south of Mount Kenia. J 5.

Ulu—Station on the Uganda Railway 276 miles from Mombasa and about 50 miles southeast from Nairobi; altitude 5,250 feet. J–K 4–5.

Ulukenia Hills—On the Athi Plains east of Nairobi. Also written Ulucania or Lukenia. J 4.

Ulu Station—See Ulu. J–K 4–5.

Uma River—South of Wadelai, Uganda, and north of Albert Nyanza. Also called Ome River. I 2.

Useri River—Fifteen miles east of Kilimanjaro, in British East Africa. K 5.

Voi—Station on the railway 103 miles northwest from Mombasa. Altitude 1,830 feet. K 5.

Wadiola River—A small affluent of the Mbalageti River in northern German East Africa, southwest from Ikoma in the latitude of Speke Gulf. J–K 3.

Wambugu—Between Fort Hall and Mount Kenia at 5,300 feet altitude. J 4–5.

Wami Hill—On the Kapiti Plains, British East Africa. J 4.

Yala River—See Lukosa River. I 3.

Zanzibar—Town on Zanzibar Island. L 5.

Zanzibar Island—Off the coast of German East Africa. L 5.

The arrangement of orders adopted for the list is that of Osborn in his "Age of Mammals." The families and genera are in certain cases shifted about to present a sequence which seems better to show the relationships of certain groups. The generic references are often confined to the citation of the first appearance of the valid name, but frequently include other names and references if pertinent, and in most cases all synonyms based on species included in my list or on very near relatives of such forms. The type-species of each genus is given in parentheses after the original reference, not necessarily in the nomenclature of the original author but under the name

now in valid use. The references under each species or subspecies include the original description, with type-locality and location of type-specimen if known, and references to most of the published literature on East African specimens in the National Museum where the authors have used technical names. Any other important references are frequently cited. The plates illustrate the skulls of all type-specimens of mammals of the three orders included in this part which are in the museum. One type-specimen (*Felis leo nyanzæ*) is the skin only and consequently is not figured.

Of the 63 type skulls 60 are here figured for the first time.

A rather large proportion of the specimens in the museum had been provisionally identified by other workers. Much of the material collected by the Smithsonian African Expedition and by the Rainey Expedition had been sorted out and labeled by Mr. Edmund Heller. This preliminary work by others has often been of great help to me, but in many cases, as might be expected, I have been forced to disagree with previous determinations of single specimens or of large series, and am entirely responsible for the determination of every specimen listed in this report. Differences with previous workers in many cases are merely the results of advantages due to the receipt of more material, the benefit of recently published papers, or, in some cases, to a difference of opinion in nomenclature.

Great credit is especially due to Mr. Heller for his success in the field on both of the major expeditions, and his interest in the preliminary arrangement and classification of the collections amassed by himself and his colleagues. His notes on specimens in European museums and the specimens compared by him with the types in those institutions, as well as his exceedingly interesting and valuable journals of the field work, have been of great help in the present work.

# Order INSECTIVORA.

## Family ERINACEIDÆ.

### Genus ERINACEUS Linnæus.

1758. *Erinaceus* Linnæus, Syst. Nat., ed. 10, vol. 1, p. 52. (*E. europæus.*)
1848. *Atelerix* Pomel, Archiv. Sci., Phys., Natur., Bibl. Univ. Genève, vol. 9, p. 251. November. (*E. albiventris.*)
1866. *Peroëchinus* Fitzinger, Sitz.-ber. Kais. Acad. Wiss., Wien, vol. 14, pt. 1, p. 565. (*E. pruneri.*)

The only form of the hedgehog included in the collection is the common British East African representative of the four-toed group. Other species, including members of five-toed groups, are known from Somaliland, Abyssinia, and Sudan.

### ERINACEUS ALBIVENTRIS HINDEI Thomas.

Plate 6, figs. 1, 2.

1892. *Erinaceus albiventris* True, Proc. U. S. Nat. Mus., vol. 15, p. 469. (Not of Wagner.)

1910. *Erinaceus hindei* Thomas, Ann. and Mag. Nat. Hist., ser. 8, vol. 5, p. 193. February. (Kitui, British East Africa; type in British Museum.)

1910. *Erinaceus albiventris* Roosevelt, African Game Trails, Amer. ed., pp. 474 and 479; London ed., pp. 485 and 491. (Not of Wagner.)

1910. *Erinaceus sotikæ* Heller, Smithsonian Misc. Coll., vol. 56, No. 15, p. 1. December 23. (Southern Guaso Nyiro River, British East Africa; type in U. S. Nat. Mus.)

*Specimens.*—Fourteen, from the following localities:

British East Africa: Kapiti Plains, 1 (Loring); Loita Plains, 2 (Heller); Mount Lololokwi, 1 (Heller); Southern Guaso Nyiro River, 7 (Loring, Mearns); Taveta, 1 (Abbott); Ulukenia Hills, Athi Plains, 2 (Loring).

The great amount of individual variation in the skull shown in the above series makes it plain that the original diagnoses of the two described forms of the hedgehog from British East Africa have been based mainly on unreliable characters. Among specimens from a single locality are some in which the maxillæ are in contact with the nasal bones for 3.8 millimeters; and others in which the premaxillæ extend backward and touch or lap the tips of the processes of the frontals, entirely cutting off the maxillæ from the nasals. In two skulls these differences obtain on opposite sides of the same specimen. Length and breadth of nasal bones are also so variable as to appear valueless as characters of subspecific distinction.

Additional specimens from the Sotik, collected since the original publication of *Erinaceus sotikæ*, show such wide variation from the type as to make it impossible to recognize a second race. Several specimens from the two general regions are virtually indistinguishable and there appear to be no average characters outside the range of individual variation represented. The color of the feet seems to be a question of age. The younger specimens all have the feet quite blackish, while adults exhibit a tendency toward pale brown or even whitish feet, according to the age of the individual as indicated by wear of the teeth. Much additional material from numerous localities and a careful revision will be necessary before the true relationships of the named forms of this group of hedgehogs will be known. Names which require consideration in such a revision are *Erinaceus pruneri* Wagner[1] (Nile Valley) and *Erinaceus albiventris atratus* Rhoads[2] (Ngare Nocbor, Lake Rudolf).

A female hedgehog collected by Heller on the Loita Plains May 28 contained four embryos. Mearns records the color of the irides

[1] Schreber, Suppl., vol. 2, p. 23, 1841.

[2] Proc. Acad. Nat. Sci. Philadelphia, 1896, p. 544.

*Measurements of specimens of Erinaceus albiventris hindei from British East Africa.*

| Locality. | No. | Sex. | Head and body. | Tail vertebræ. | Hind foot. | Ear from crown. | Skull: Condylobasal length. | Zygomatic breadth | Mastoid breadth | Postorbital constriction. | Breadth of rostrum at premaxillary suture. | Greatest length nasals. | Mandible. | Maxillary tooth row, entire (alveoli). | Mandibular tooth row, entire (alveoli). | Condition of teeth. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Mount Lololokwi | 182652 | Male | 172 | 25 | 25 | 26 | 42.9 | 27.2 | 18.9 | 11.2 | 8.3 | 11.8 | 32.5 | 20.3 | 15.4 | Much worn. |
| Ulukenia Hills | 164022 | ...do | 198 | 38 | 30 | 24 | 41.0 | 26.7 | 21.8 | 11.4 | 8.2 | 13.3 | 32.2 | 20.3 | 17.0 | Do. |
| Do | 164023 | ...do | 184 | 33 | 29 | 22 | 41.5 | 25.4 | 20.1 | 11.1 | 8.3 | 11.6 | 31.8 | 20.8 | 17.4 | Do. |
| Kapiti Plains | 161699 | ...do | 194 | ..... | 29 | ..... | 42.4 | 27.6 | 21.5 | 11.2 | 8.3 | 14.2 | 31.6 | 20.6 | 16.8 | Do. |
| S. Guaso Nyiro River | [1] 162112 | ...do | 170 | 26 | 31 | ..... | 42.1 | 26.7 | 20.8 | 11.0 | 9.5 | 15.8 | 32.4 | 21.4 | 17.6 | Moderately worn. |
| Do | 162113 | ...do | 172 | 28 | 27 | ..... | 38.5 | 24.4 | 19.3 | 11.0 | 8.2 | 14.2 | 29.3 | 19.2 | 16.7 | Little worn. |
| Do | 162116 | ...do | 195 | 23 | 31 | 21 | 41.0 | ..... | 20.8 | 11.1 | 8.3 | 14.2 | 31.3 | 20.5 | 16.8 | Moderately worn. |
| Loita Plains | 181442 | Female | 205 | 20 | 26 | 26 | 40.2 | 26.7 | 21.0 | 11.3 | 8.5 | 12.2 | 31.6 | 19.8 | 17.0 | Considerably worn. |

[1] Type of *Erinaceus sotikæ*.

as dark brown. All the collectors note finding numbers of the spiny skins of the back, the fleshy parts of the animals having been eaten by some carnivorous bird or beast.

For measurements of specimens see page 27

## Family MACROSCELIDÆ.

### Genus RHYNCHOCYON Peters.

1847. *Rhynchocyon* Peters, Mon.-ber. K. Preuss. Akad. Wiss., Berlin, p. 36. (*R. cirnei.*)

No specimens of these large and richly colored elephant-shrews were obtained by the Smithsonian African Expedition. The single specimen in the museum was collected in the coast region near Mombasa by the Rainey Expedition in 1911. The animals are evidently difficult to secure, or are much restricted in their distribution.

#### RHYNCHOCYON PETERSI PETERSI Bocage.

1880. *Rhynchocyon petersi* Bocage, Journ. Sci., Math., Phys. Nat., Acad. Sci. Nat. Lisboa, vol. 7, p. 159. (Mainland of East Africa, region of Zanzibar; type in Museu Bocage, Lisbon.)

1900. *Rhynchocyon petersi usambarae* Neumann, Zool. Jahrb., Syst., vol. 13, p. 542. (Usambara Mts., German East Africa; type in Berlin Museum.)

1912. *Rhynchocyon petersi* Dollman, Ann. and Mag. Nat. Hist., ser. 8, vol. 10, pp. 130, 131. July. (Fixes type-locality.)

*Specimen.*—One skin and skull, with the skinned body in alcohol, from:

British East Africa: Mazeras (Heller).

This specimen, an adult nursing female, measures: Head and body, 275 millimeters; tail vertebræ, 240; hind foot, 67; ear, 29. Skull: Greatest length, 66.7; condylobasal length, 61.9; zygomatic breadth, 35.1; least interorbital breadth, 21.2; least breadth of rostrum, 12.8; length of mandible, 51.7. Teeth: Entire upper row, 30; upper molariform series, 17; entire lower row, 33.2.

### Genus CERCOCTENUS Hollister.

1916. *Cercoctenus* Hollister, Smithsonian Misc. Coll., vol. 65, No. 1, p. 1, February 10. (*C. sultan.*)

These giant jumping shrews apparently are confined in British East Africa to the region of the coast, inland to the Taita Hills. Like *Rhynchocyon* they are represented in our collection only by the specimens collected by the Rainey Expedition in that district.

CERCOCTENUS SULTAN SULTAN (Thomas).

1897. *P[etrodromus] sultani* THOMAS, Proc. Zool. Soc. London, p. 435. (Mombasa, British East Africa; type in British Museum.)

1897. *P[etrodromus] sultan* THOMAS, Proc. Zool. Soc. London, p. 928. (Correction of misprint.)

1916. *Cercoctenus sultan* HOLLISTER, Smithsonian Misc. Coll., vol. 66, No. 1, p. 2. February 10.

*Specimens.*—Forty, including six in alcohol, from:

BRITISH EAST AFRICA: Mazeras (Heller).

Three females contained one large fetus each, on December 21 and 24. Two of these fetuses are preserved in alcohol. The label of one adult specimen records the stomach contents as termites. As stated by Heller,[1] this excellent series proves conclusively the great sexual difference in color in this species. The females are much more richly colored than the males and have the entire underparts washed, often quite heavily, with ochraceous-buff; the sides of the body, hips, and the outer side of legs are also richly colored with deep ochraceous. In the series of males, all the specimens have the underparts much paler, whitish or creamy-buff, and the sides and legs are decidedly grayer. Heller further states:

> This large insectivore is known to the Duruma tribe as sangi. They are an article of diet with these negroes who catch them in snares set along their runways in the forests.

This large elephant shrew has the same diurnal habits as *Elephantulus*, for Heller saw one running along its trail at five o'clock in the afternoon in the bright sunshine.

CERCOCTENUS SULTAN SANGI (Heller).

Plate 6, figs. 6, 7.

1912. *Petrodromus sultani sangi* HELLER, Smithsonian Misc. Coll., vol. 60, No 12, p. 12. November 4. (Mt. Mbololo, British East Africa; type in U. S. Nat. Mus.)

1916. *Cercoctenus sultan sangi* HOLLISTER, Smithsonian Misc. Coll., vol. 66, No. 1, p. 2. February 10.

*Specimen.*—One, the type, from:

BRITISH EAST AFRICA: Mount Mbololo, Taita Hills, at 4,000 feet altitude (Heller).

I can not distinguish this specimen by color from the Mazeras series of males of *C. s. sultan*. The skull is chiefly distinguished by its narrow rostrum; and the upper premolars are noticeably smaller than in any male of the Mazeras series.

For measurements of specimens of *Cercoctenus* see table, page 30.

[1] Smithsonian Misc. Coll., vol. 60, No. 12, p. 13. November 4, 1912.

*Measurements of Specimens of Cercoctenus sultan.*

| Form and locality. | No. | Sex. | Head and body. | Tail vertebræ. | Hind foot. | Ear. | Skull: Condylobasal length. | Zygomatic breadth | Interorbital breadth | Median length nasals. | Mandible. | Upper tooth row (entire). | Upper molariform teeth. | Lower tooth row (entire). | Condition of teeth. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *C. s. sultan.* | | | | | | | | | | | | | | | |
| B. E. A.: Mazeras | 182617 | Male | 190 | 161 | 56 | 34 | 54.2 | 29.4 | 8.4 | 21.1 | 44.4 | 29.9 | 13.8 | 27.8 | Moderately worn. |
| Do | 182619 | do | 120 | 158 | 54 | 36 | 53.5 | 29.7 | 8.2 | 19.8 | 43.6 | 29.0 | 12.5 | 26.7 | Much worn. |
| Do | 182620 | do | 195 | 169 | 57 | 35 | 52.4 | 28.9 | 8.3 | 20.2 | 42.3 | 29.9 | 14.3 | 27.3 | Unworn. |
| Do | 182621 | do | 195 | 174 | 57 | 34 | 54.4 | 30.5 | 8.4 | 19.8 | 43.9 | 29.8 | 13.3 | 27.9 | Moderately worn. |
| Do | 182624 | do | 190 | 150 | 55 | 35 | 55.2 | 30.8 | 8.8 | 21.0 | 44.7 | 30.2 | 13.3 | 27.3 | Do. |
| Do | 182625 | do | 200 | 171 | 55 | 35 | 52.2 | 29.0 | 8.2 | 20.5 | 42.3 | 29.1 | 13.2 | 26.2 | Do. |
| Do | 182627 | do | 195 | 162 | 55 | 35 | 53.2 | 30.5 | 8.8 | 19.8 | 43.4 | 28.9 | 13.0 | 26.7 | Do. |
| Do | 182629 | do | 200 | 163 | 57 | 36 | 53.8 | 28.7 | 8.3 | 20.9 | 42.9 | 30.7 | 13.9 | 28.2 | Do. |
| Do | 182637 | do | 190 | 165 | 56 | 33 | 51.9 | 28.8 | 8.4 | 19.5 | 41.7 | 28.8 | 13.3 | 26.8 | Little worn. |
| Do | 182638 | do | 190 | 150 | 53 | 34 | 51.5 | ..... | 8.1 | 18.5 | 41.4 | 28.0 | 12.8 | 25.9 | Moderately worn. |
| Do | 182643 | do | 190 | 152 | 52 | 34 | 52.8 | 30.4 | 8.5 | 19.6 | 43.5 | 28.7 | 12.9 | 26.5 | Much worn. |
| Do | 182645 | do | 210 | 164 | 57 | 35 | ..... | 29.0 | 8.8 | 20.9 | 44.2 | 29.6 | 13.1 | 27.3 | Do. |
| Do | 182646 | do | 200 | 165 | 57 | 36 | 55.6 | 30.6 | 8.6 | 20.9 | 45.7 | 30.8 | 13.4 | 28.5 | Do. |
| Do | 182647 | do | 195 | 155 | 54 | 34 | 53.0 | 30.8 | 8.6 | 20.4 | 43.6 | 29.2 | 12.7 | 27.0 | Moderately worn. |
| Do | 182649 | do | 200 | 163 | 54 | 35 | 55.2 | 29.9 | 8.3 | 19.9 | 44.3 | 30.0 | 13.9 | 27.6 | Much worn. |
| Do | 182618 | Female | 190 | 164 | 55 | 33 | 52.4 | 29.7 | 8.8 | 18.3 | 42.4 | 29.0 | 13.1 | 26.0 | Do. |
| Do | 182623 | do | 200 | 162 | 55 | 36 | 54.1 | 30.1 | 8.5 | 20.3 | 43.6 | 29.6 | 13.2 | 27.3 | Do. |
| Do | 182626 | do | 200 | 160 | 54 | 34 | 52.2 | 29.3 | 8.0 | 20.4 | 41.8 | 28.9 | 13.0 | 26.8 | Moderately worn. |
| Do | 182628 | do | 210 | 168 | 57 | 34 | 54.9 | 30.3 | 8.6 | 20.0 | 44.4 | 30.3 | 13.4 | 27.3 | Much worn. |
| Do | 182630 | do | 190 | 166 | 54 | 34 | 51.7 | 28.4 | 8.0 | 18.6 | 41.5 | 29.5 | 13.8 | 27.2 | Little worn. |
| Do | 182631 | do | 175 | 166 | 55 | 34 | 50.0 | 26.6 | 8.2 | 18.2 | 40.3 | ..... | ..... | 27.3 | $m^2$ not in place. |
| Do | 182633 | do | 200 | 174 | 57 | 35 | 54.6 | 30.4 | 8.4 | 20.2 | 43.5 | 29.4 | 13.3 | 27.1 | Much worn. |
| Do | 182636 | do | 190 | 170 | 55 | 34 | 52.6 | 28.7 | 7.8 | 19.7 | 42.8 | 29.7 | 13.4 | 27.7 | Moderately worn. |
| Do | 182640 | do | 220 | 164 | 56 | 36 | 54.8 | 29.9 | 8.5 | 19.9 | 44.0 | 29.8 | 13.2 | 27.3 | Much worn. |
| Do | 182641 | do | 200 | 172 | 56 | 35 | ..... | 28.0 | 7.7 | 19.7 | 40.6 | 28.6 | 13.8 | 27.1 | Unworn. |
| *C. s. sangi.* | | | | | | | | | | | | | | | |
| B. E. A.: Mt. Mbololo | [1]181822 | Male | 190 | ..... | 56 | 34 | 52.2 | 29.1 | 8.1 | 20.4 | 41.7 | 28.6 | 13.2 | 26.8 | Moderately worn. |

[1] Type.

### Genus NASILIO Thomas and Schwann.

1906. *Nasilio* Thomas and Schwann, Abstr. Proc. Zool. Soc. London, No. 33, p. 10. June. (*N. brachyrhynchus.*)

The lesser jumping shrews are widely distributed in East Africa, and specimens were collected by members of the Smithsonian African Expedition in many localities. The genus is known to occur in Uganda, but no specimens from that region are in the collection.

#### NASILIO BRACHYRHYNCHUS DELAMEREI (Thomas).

1901. *Macroscelides delamerei* Thomas, Ann. and Mag. Nat. Hist., ser. 7, vol. 8, p. 155, August. (Athi River, British East Africa; type in British Museum.)

1910. *Nasilio brachyrhynchus delamerei* Roosevelt, African Game Trails, Amer. ed., p. 474; London ed., p. 485.

*Specimens.*—Twenty-seven, from the following localities:

British East Africa: Engare Narok River, 1 (Loring); Kapiti Plains, 1 in alcohol (Loring); Loita Plains, 1 (Heller); Southern Guaso Nyiro, 13, including 3 in alcohol (Loring, Heller); Ulukenia Hills, 11, including 4 in alcohol (Loring).

Loring records females from Ulukenia Hills pregnant as follows: November 26, two with two embryos each; November 27, one with one embryo; and from the Southern Guaso Nyiro, two large fetuses each in females taken June 21 and 30. The specimens from Southern Guaso Nyiro and Loita Plains seem to be identical in color with the skins from Ulukenia Hills.

#### NASILIO BRACHYRHYNCHUS ALBIVENTER Osgood.

1910. *Nasilio brachyrhynchus albiventer* Osgood, Field Mus., Zool. Ser., vol. 10, No. 2, p. 13. February. (Lake Elmenteita, British East Africa; type in Field Mus. Nat. Hist.)

*Specimens.*—Six, from localities as follows:

British East Africa: Bargunett River, Meru Road, 1 (Heller); Engare Ndare River, 1 (Clark); Lesiweru River, Meru Road, 1 (Heller); Naivasha Station, 2 (Loring); Nyuki River, 1 in alcohol (Heller.)

This is a slight color subspecies, apparently recognizable from *delamerei* only by the average darker tones of the upperparts. The Naivasha Lake skins, while nearest to *albiventer*, are clearly intermediate toward *delamerei*. Young examples of both subspecies are usually considerably darker and richer colored than fully adult animals.

For measurements of specimens of *Nasilio* see table, page 32.

*Measurements of Specimens of Nasilio from British East Africa.*

| Form and locality. | No. | Sex. | Head and body. | Tail vertebræ. | Hind foot, dry. | Skull: Condylobasal length. | Zygomatic breadth. | Length of nasals. | Interorbital breadth. | Mandible. | Upper tooth row, entire. | Condition of teeth. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *N. b. delamerei.* | | | | | | | | | | | | |
| Ulukenia Hills | 164009 | Male | 120 | 106 | 27 | 30.5 | 18.7 | 11.3 | 5.9 | 24.2 | 16.9 | Moderately worn. |
| Do | 164010 | do | 124 | 110 | 27 | 31.7 | 18.5 | 11.5 | 5.9 | 25.5 | 17.2 | Do. |
| Do | 164011 | do | 138 | 113 | 29 | 31.9 | 18.8 | 12.3 | 5.7 | 25.8 | 17.2 | Much worn. |
| Do | 164013 | do | 123 | 120 | 29 | 32.4 | 19.1 | 12.8 | 5.8 | 25.9 | 17.3 | Do. |
| Do | 164014 | do | 125 | 122 | 28 | 31.3 | 18.0 | 12.6 | 5.4 | 25.3 | 17.7 | Moderately worn. |
| Do | 164012 | Female | 116 | 112 | 28 | 30.8 | 17.6 | 12.2 | 5.5 | 24.7 | 17.3 | Unworn. |
| Southern Guaso Nyiro | 162059 | Male | 119 | 105 | 27 | 30.8 | 18.0 | 12.6 | 5.6 | 25.0 | 17.6 | Little worn. |
| Do | 162061 | do | | | | 32.2 | 18.2 | 12.8 | 5.7 | 25.3 | 17.4 | Do. |
| Do | 162062 | do | 115 | 100 | 27 | 32.7 | | 12.6 | 5.9 | 24.6 | 17.2 | Do. |
| Do | 162063 | do | 108 | 108 | 28 | 31.0 | | 12.7 | | 24.8 | 17.2 | Moderately worn. |
| Do | 162064 | do | 112 | | 28 | 31.9 | 18.5 | 12.6 | 5.8 | 25.4 | 17.7 | Do. |
| Loita Plains | 181461 | do | 120 | 115 | 27 | 31.5 | 18.9 | 12.6 | 6.0 | 25.2 | 17.0 | Do. |
| *N. b. albiventer.* | | | | | | | | | | | | |
| Lesiweru River | 182615 | do | 120 | 108 | 29 | 32.7 | 18.3 | 12.7 | 5.9 | 26.3 | 18.5 | Very little worn. |
| Engare Ndare River | 182616 | do | 112 | 108 | 29 | | | | | | | |
| Nyuki River | 165611 | Female | | | | 31.9 | 18.0 | 12.7 | 6.2 | 25.4 | 18.0 | Little worn. |
| Naivasha Station | 102069 | Male | 123 | 111 | 29 | 32.2 | 19.0 | 12.8 | 6.1 | 26.1 | 17.5 | Much worn. |

### Genus ELEPHANTULUS Thomas and Schwann.

1906. *Elephantulus* Thomas and Schwann, Abstr. Proc. Zool. Soc. London, No. 33, p. 10. June. (*E. rupestris.*)

In the treatment of the forms of the jumping shrews of the genus *Elephantulus* from British East Africa I have followed Heller's disposition of them as races of *rufescens*,[1] although our collection alone does not in any case show actual intergradation between the various named forms.

For measurements of specimens of this genus, see pages 34–35.

#### ELEPHANTULUS RUFESCENS RUFESCENS (Peters).

1878. *Macroscelides rufescens* Peters, Mon.-ber. K. Preuss. Akad. Wiss. Berlin, p. 198. March. (Ndi, Taita Hills, British East Africa; type in Berlin Museum?)

*Specimens.*—Seven, from the following localities:

British East Africa: Mtoto Andei, 3 (Heller); Voi, 4 (Heller).

Heller records on the label of one skin from Mtoto Andei that the animal was shot on a roadway at 8 o'clock in the morning. In his journal he tells of seeing several jumping shrews running about in the bright sunshine. A female from the same place, April 3, was pregnant with one large fetus.

#### ELEPHANTULUS RUFESCENS MARIAKANÆ Heller.

Plate 6, fig. 3.

1912. *Elephantulus rufescens mariakanæ* Heller, Smithsonian Misc. Coll., vol. 60, No. 12, p. 10. November 4. (Mariakani, British East Africa; type in U. S. Nat. Mus.)

*Specimens.*—Five, from—

British East Africa: Mariakani (Heller).

This is a much less reddish form than true *rufescens* and is somewhat intermediate in color between that form and *phæus* of the more interior regions. It is a coast subspecies and its range is separated from that of *phæus* by the desert country inhabited by *rufescens*.

#### ELEPHANTULUS RUFESCENS PHÆUS Heller.

Plate 6, figs. 4, 5.

1910. *Elephantulus pulcher* Roosevelt, African Game Trails, Amer. ed., pp. 474, 479, and 487; London ed., pp. 485, 491, and 498. (Not of Thomas.)

1910. *Elephantulus phæus* Heller, Smithsonian Misc. Coll., vol. 56, No. 15, p. 8. December 23. (Njoro O Solali, Sotik District, British East Africa; type in U. S. Nat. Mus.)

*Specimens.*—Twenty-six, from localities as follows:

British East Africa: Kabalolot Hill, Sotik, 6 (Heller); Lime Springs, Sotik, 3 (Heller); Loita Plains, 1 (Heller); Njoro O Solali,

[1] Smithsonian Misc. Coll., vol. 60, No. 12, p. 11. Nov. 4, 1912.

*Measurements of Specimens of Elephantulus from British East Africa.*

| Form and locality. | No. | Sex. | Head and body. | Tail vertebræ. | Hind foot, dry. | Skull: Condylo-basal length. | Zygomatic breadth | Length of nasals. | Interorbital breadth | Mandible. | Upper tooth row, entire. | Condition of teeth. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *E. r. rufescens.* | | | | | | | | | | | | |
| Voi | 182611 | Male | 120 | 101 | 30 | 33.6 | 19.4 | 13.2 | 5.6 | 26.4 | 17.7 | Moderately worn. |
| Do | 182612 | ...do | 120 | 108 | 29 | 31.4 | 18.9 | 12.5 | 5.7 | 24.6 | 16.8 | Do. |
| Do | 182613 | ...do | 120 | 118 | 30 | ..... | ..... | 11.8 | 5.9 | 25.3 | 16.8 | Much worn. |
| Mtoto Andei | 181443 | ...do | 120 | 103 | 30 | ..... | 17.9 | 11.7 | 5.9 | ..... | 17.1 | Little worn. |
| Do | 181444 | ...do | 120 | 106 | 30 | 31.9 | 19.0 | 11.8 | 5.8 | 25.0 | 16.7 | Moderately worn. |
| Do | 181446 | Female | 121 | 114 | 30 | 31.3 | 18.5 | 11.6 | 5.5 | 24.3 | 16.3 | Little worn. |
| *E. r. mariakanæ.* | | | | | | | | | | | | |
| Mariakani | 182607 | Male | 132 | 123 | 31 | ..... | ..... | 12.2 | ..... | 25.7 | 17.4 | Moderately worn. |
| Do | [1] 181821 | Female | 130 | 108 | 30 | 32.8 | 19.3 | 12.3 | 6.1 | 25.9 | 17.3 | Do. |
| *E. r. phæus.* | | | | | | | | | | | | |
| So. Guaso Nyiro | 162072 | Male | 132 | 122 | 32 | 34.4 | 20.4 | 12.9 | 6.1 | 26.4 | 17.6 | Much worn. |
| Do | 162073 | ...do | 121 | 127 | 32 | 32.9 | 19.8 | 12.7 | 5.9 | 25.5 | 17.3 | Moderately worn. |
| Njoro O Solali | [1] 162074 | ...do | 133 | 133 | 33 | 34.1 | 19.8 | 13.3 | 5.8 | 26.6 | 17.4 | Do. |
| Do | 162075 | ...do | 128 | 132 | 32 | 33.8 | 20.3 | 13.3 | 5.8 | 26.2 | 17.3 | Do. |
| Kabalolot Hill | 181452 | ...do | 130 | ..... | 32 | ..... | 19.7 | 11.8 | 5.9 | 24.8 | 17.1 | Do. |
| Do | 181453 | ...do | 135 | ..... | 32 | 33.8 | 20.1 | 12.9 | 6.1 | 26.2 | 17.7 | Do. |
| Do | 181455 | ...do | 103 | 116 | 33 | 33.7 | ..... | 13.2 | 6.2 | 27.0 | 17.4 | Much worn. |
| Do | 181451 | Female | 150 | 125 | 32 | 34.2 | 20.5 | 12.3 | 5.9 | 27.1 | 17.7 | Do. |
| Do | 181454 | ...do | 136 | 123 | 33 | 33.1 | 20.1 | 12.7 | 6.1 | 26.2 | 17.0 | Do. |
| Telek River | 181459 | Male | 130 | 118 | 32 | 33.2 | 20.0 | 12.1 | 6.0 | 26.2 | 17.4 | Do. |
| Do | 181457 | Female | 130 | 120 | 32 | 32.8 | 20.1 | 12.1 | 5.8 | 26.3 | 17.1 | Do. |
| Do | 181458 | ...do | 140 | 129 | 33 | 33.4 | 19.7 | 12.4 | 5.7 | 26.4 | 17.8 | Little worn. |
| Do | 181460 | ...do | 140 | 129 | 33 | 34.3 | 20.5 | 13.1 | 6.1 | 27.3 | 17.8 | Moderately worn. |
| Loita Plains | 181450 | ...do | 135 | 105 | 31 | 33.3 | 19.9 | 12.2 | 6.0 | 25.7 | 17.5 | Do. |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *E. r. dundasi.* | | | | | | | | | | | | |
| North Loroghi | 182603 | Male | 126 | 135 | 33 | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Nyama Nyango | 182601 | do | 128 | 135 | 33 | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| Do | 182602 | Female | 129 | 125 | 32 | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| *E. r. boranus.* | | | | | | | | | | | | |
| Nor. Guaso Nyiro | [2] 165605 | Male | ..... | 123 | 31 | 33.7 | 19.1 | 12.3 | 5.6 | 25.5 | 17.4 | Moderately worn. |
| *E. r. delicatus.* | | | | | | | | | | | | |
| Mt. Nyiro | 182600 | ..... | 127 | 148 | 33 | ..... | ..... | ..... | ..... | ..... | ..... | ..... |

[1] Type.

[2] Preserved in alcohol.

Sotik, 3 (Loring); Southern Guaso Nyiro, 8, including 5 in alcohol (Heller, Loring); Telek River, Sotik, 5 (Heller).

Heller records, on the labels of specimens, one embryo each in females collected as follows: Kabalolot Hill, April 30, May 4; Loita Plains, April 27; and Telek River, May 20.

This is the darkest race of *Elephantulus* represented in our collections from East Africa.

Roosevelt and Heller speak of this jumping shrew as follows:[1]

> Fairly common throughout British East Africa in bush and on hills, not in deep forests or on bare plains. Often out at dusk, but generally nocturnal. A gravid female contained a single embryo. One in a trap had its mouth full of partly masticated brown ants. A gentle thing, without the fierceness of the true shrews. Trapped in runways of *Arvicanthis*.

Loring, in Appendix C of Roosevelt's African Game Trails, has the following notes on this form:

> Both diurnal and nocturnal. While riding over the country I frequently saw them darting through the runways from one thicket to another. Nearly every clump of bushes and patch of rank vegetation in the Sotik and Naivasha districts was traversed with well-worn trails, used by different species of *Mus* and shrews. The elephant shrews were most common on the dry flats, where clumps of fiber plants grew, and their trails usually led into some thorny thicket and finally entered the ground.

**ELEPHANTULUS RUFESCENS DUNDASI Dollman.**

1910. *Elephantulus dundasi* DOLLMAN, Ann. and Mag. Nat. Hist., ser. 8, vol. 5, p. 95. January. (Harich, near Lake Baringo, British East Africa; type in British Mus.)

1912. [*Elephantulus rufescens*] *dundasi* HELLER, Smithsonian Misc. Coll., vol. 60, No. 12, p. 11. November 4.

*Specimens.*—Three, from localities as follows:

BRITISH EAST AFRICA: North Loroghi, 1 (Percival); Nyama Nyango, Northern Guaso Nyiro, 2 (Percival).

[1] Roosevelt, African Game Trails, Amer. ed., p. 479; London ed., p. 491. 1910.

This form is decidedly nearest in general coloration to *Elephantulus rufescens mariakanæ* Heller, of the coast district of southeastern British East Africa. It has a longer, fuller pelage than *mariakanæ*, and is slightly more rufous, less grayish or wood brown in color.

ELEPHANTULUS RUFESCENS BORANUS (Thomas).

1901. *Macroscelides boranus* Thomas, Proc. Zool. Soc. London, 1900, p. 802. April. (Mega, Western Boran Galla, southeast of Lake Rudolf, British East Africa; type in British Museum.)
1910. *E[lephantulus] boranus* Dollman, Ann. and Mag. Nat. Hist., ser. 8, vol. 5, p. 96. January.
1912. [*Elephantulus rufescens*] *boranus* Heller, Smithsonian Misc. Coll., vol. 60, No. 12, p. 11. November 4.

*Specimen.*—One, in alcohol, from—

British East Africa: Northern Guaso Nyiro River (Heller).

This single specimen represents a form not otherwise included in the collection. It agrees well with the description of *boranus* and differs from the skins of *dundasi* and *delicatus* by its darker color above and below, and is further distinguished from *delicatus* by its broadly dark slate underfur on the breast and belly.

ELEPHANTULUS RUFESCENS RENDILIS Lönnberg.

1912. *Elephantulus pulcher rendilis* Lönnberg, Kungl. Svenska Vet. Handl., vol. 48, No. 5, p. 49. (Thera and below Chanler Falls, north of Guaso Nyiro, British East Africa; type in R. Nat. Mus., Stockholm.)

*Specimen.*—One, from—

British East Africa: Longaya Water, Marsabit Road (Heller).

Although immature, this specimen is clearly of a form different from *boranus* and perhaps closely allied to *delicatus*. The hairs of the middle underparts are white to the bases, and the general color above somewhat approaches that of certain specimens of true *rufescens*. The specimen is, without doubt, the young of *rendilis*, but whether that form is really distinguishable from *delicatus* or not, our material is not sufficient to prove.

In his notes written at Longaya, Heller mentions seeing two elephant shrews running about the rocks at ten o'clock in the forenoon, in the hot sun.

ELEPHANTULUS RUFESCENS DELICATUS Dollman.

1911. *Elephantulus delicatus* Dollman, Ann. and Mag. Nat. Hist., ser. 8, vol. 8, p. 652. November. (Orr Valley, Mount Nyiro, British East Africa; type in British Museum.)

*Specimen.*—One, from—

British East Africa: Orr Valley, Mount Nyiro (Percival).

## Family SORICIDÆ.

### Genus SURDISOREX Thomas.

1906. *Surdisorex* Thomas, Ann. and Mag. Nat. Hist., ser. 7, vol. 18, p. 223. September. (*S. noræ*.)

Two closely related species of short-tailed shrews are included in the collections. All the specimens are from high altitudes, none having been taken below 9,000 feet.

For measurements of the specimens see table, page 38.

#### SURDISOREX NORÆ Thomas.

1906. *Surdisorex noræ* Thomas, Ann. and Mag. Nat. Hist., ser. 7, vol. 18, p. 223. September. (East side of Aberdare Range, near Nyeri, British East Africa; type in British Museum.)

1910. *Surdisorex noræ* Roosevelt, African Game Trails, Amer. ed., pp. 474 and 480; London ed., pp. 486 and 491.

*Specimens.*—Nine (three in alcohol), from—

British East Africa: Aberdare Mountains, 10,000 to 11,000 feet (Heller).

Only one skull, out of the nine specimens of this shrew in the collection, shows the small second lower unicuspid tooth described by Thomas in the type. In this specimen the extra tooth is well developed on both sides and can be plainly seen without the aid of a glass. A single female, preserved in alcohol, August 10, shows 3–3 inguinal mammæ. Heller records two embryos in a female collected October 12. His notes state that the species is diurnal.

#### SURDISOREX POLULUS Hollister.

Plate 7, figs. 1, 2.

1910. *Surdisorex noræ* Roosevelt, African Game Trails, Amer. ed., p. 487; London ed., p. 498. (Not of Thomas.)

1916. *Surdisorex polulus* Hollister, Smithsonian Misc. Coll., vol. 66, No. 1, p. 1. February 10. (Mount Kenia, British East Africa; type in U. S. Nat. Mus.)

*Specimens.*—Thirty-five (four in alcohol), from—

British East Africa: West side of Mount Kenia, 9,000 to 12,000 feet (Loring, Mearns).

Out of this large series only a single skull shows the extra lower unicuspid, and this one on one jaw only. The specimens were all collected between September 22 and October 8. There are some in complete new coat and others in which the change has barely commenced. The numerous moulting skins show the process of renewal to be rather evenly accomplished, from the head backward, in a definite line. Loring records a female, October 4, with one embryo

*Measurements of specimens of Surdisorex from British East Africa.*

| Species, locality, and No. | Sex. | Head and body. | Tail vertebræ. | Hind foot. | Skull: Condylobasal length. | Zygomatic breadth | Breadth of brain case. | Mandible. | Upper tooth row, entire. | Lower tooth row, entire. | Condition of teeth. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *S. noræ.* | | | | | | | | | | | |
| Aberdare Mountains: | | | | | | | | | | | |
| 165513 | Male | ..... | ..... | 16.0 | ..... | ..... | ..... | 14.5 | 11.0 | 10.1 | Little worn. |
| 165515 | do | ..... | ..... | 16.4 | ..... | ..... | ..... | 14.8 | 11.1 | 10.1 | Moderately worn. |
| 182582 | do | 100 | 33 | 15.5 | 25.2 | 7.3 | ..... | 14.4 | 11.4 | 10.2 | Do. |
| 182583 | do | 100 | 33 | 15.5 | 25.3 | 7.2 | 13.4 | 14.5 | 11.1 | 10.2 | Do. |
| 165514 | Female | ..... | ..... | 15.5 | ..... | 7.4 | ..... | 14.8 | 11.0 | 10.3 | Do. |
| 182584 | do | 102 | 32 | 15.0 | 25.1 | 7.2 | ..... | 14.4 | 10.8 | 9.7 | Much worn. |
| 182586 | do | 96 | 34 | 16.0 | ..... | 7.2 | ..... | 14.8 | 11.4 | 10.3 | Moderately worn. |
| *S. polulus.* | | | | | | | | | | | |
| Mount Kenia: | | | | | | | | | | | |
| 163978 | Male | 96 | 31 | 16.0 | 24.5 | 6.8 | 12.3 | 14.1 | 10.8 | 9.8 | Moderately worn. |
| 163983 | do | 95 | 28 | 18 | 24.4 | 7.0 | 12.7 | 14.0 | 10.4 | 9.5 | Do. |
| 163984 | do | 91 | 31 | 16 | 24.4 | 7.0 | 12.7 | 14.2 | 10.5 | 9.5 | Considerably worn. |
| 163986 | do | 94 | 26 | 17 | 23.7 | 6.9 | 12.7 | 13.9 | 10.8 | 9.6 | Moderately worn. |
| 163992[1] | do | 92 | 30 | 17 | 24.5 | 6.8 | 12.5 | 14.4 | 10.6 | 9.6 | Do. |
| 163993 | do | 95 | 27 | 16 | 24.2 | 6.8 | 12.4 | 14.2 | 10.4 | 9.7 | Do. |
| 163980 | Female | 100 | 29 | 18 | 24.2 | 6.9 | 12.7 | 14.3 | 10.1 | 9.3 | Considerably worn. |
| 163981 | do | 97 | 29 | 17 | 24.2 | 6.8 | 12.7 | 14.2 | 10.3 | 9.5 | Do. |
| 163987 | do | 89 | 29 | 17 | 24.3 | 6.8 | 12.6 | 14.3 | 10.5 | 9.6 | Moderately worn. |
| 163994 | do | 96 | 24 | 16 | 23.7 | 6.6 | 12.5 | 14.2 | 10.2 | 9.3 | Considerably worn. |
| 163997 | do | 98 | 30 | 17 | 24.2 | 7.1 | 13.2 | 14.4 | 10.4 | 9.6 | Moderately worn. |
| 164000 | do | 93 | 29 | 16 | 23.8 | 6.5 | 12.5 | 13.7 | 10.7 | 9.7 | Do. |
| 164003 | do | 100 | 31 | 17 | 23.9 | 6.8 | 12.5 | 13.5 | 10.4 | 9.4 | Do. |
| 164004 | do | 94 | 27 | 16 | 24.5 | 7.0 | 12.9 | 14.1 | 10.3 | 9.5 | Considerably worn. |

[1] Type.

5 millimeters long; and one, October 2, with two embryos 18 millimeters in length.

With the exception of those collected at 10,000 feet, where they were trapped in open grassy and brushy parks in the bamboo, most of them were taken in runways of *Otomys*, and all of those taken at 12,100 were caught in such runways in tall marsh grass.[1]

### Genus SYLVISOREX Thomas.

1904. *Sylvisorex* Thomas, Abstr. Proc. Zool. Soc. London, No. 10, p. 12. November 22. (*S. morio.*)

Two distinct groups of forest shrews are known from Equatorial East Africa. Species of each group are included in the collections. They are readily distinguished by length of tail.

For measurements see table, page 40.

#### SYLVISOREX GEMMEUS Heller.

Plate 7, figs. 5, 6.

1910. *Sylvisorex gemmeus* Heller, Smithsonian Misc. Coll., vol. 56, No. 15, p. 7. December 23. (Rhino Camp, Lado Enclave; type in U. S. Nat. Mus.)

*Specimens.*—Thirty-seven, from the following localities:

Lado: Rhino Camp, 2 (Loring).

British East Africa: Kaimosi, 35, including 19 in alcohol (Heller, Turner).

The two specimens from Lado Enclave can be matched in every particular by skins and skulls in the series from Kaimosi. This form will eventually, without much doubt, prove to intergrade with *Sylvisorex sorella* Thomas, of Nyasaland. The form described by Doctor Lönnberg from the Isiola River, Northern Guaso Nyiro, as *Sylvisorex sorelloides*,[2] appears from the description to be very closely related. Thomas has named a subspecies from southern Uganda, *Sylvisorex gemmeus irene*[3] based on a slight color difference.

#### SYLVISOREX MUNDUS Osgood.

1910. *Sylvisorex mundus* Osgood, Field Mus., Zool. Ser., vol. 10, No. 3, p. 18. April 7. (Kijabe, British East Africa; type in Field Mus. Nat. Hist.)

*Specimens.*—Five, including 3 in alcohol, from—

British East Africa: West side of Mount Kenia, 7,000, 8,500, and 10,000 feet (Loring, Heller, Mearns).

The two skins are slightly browner, less blackish-brown, than the type-specimen, which is in fresh pelage, but are otherwise virtually indistinguishable.

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[1] African Game Trails, Amer. ed., p. 487. 1910.

[2] Ann. and Mag. Nat. Hist., ser. 8, vol. 9, p. 67. January, 1912.

[3] Ann. and Mag. Nat. Hist., ser. 8, vol. 16, p. 151. August, 1915.

*Measurements of specimens of Sylvisorex.*

| Form and locality. | No. | Sex. | Head and body. | Tail vertebræ. | Hind foot, dry. | Skull: condylobasal length. | Maxillary breadth | Breadth of braincase. | Depth of braincase (median). | Mandible. | Upper tooth row (entire). | Condition of teeth. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *S. gemmeus.* | | | | | | | | | | | | |
| Lado: Rhino Camp | [1] 164644 | Male | 69 | 72 | 15.0 | 17.5 | 5.4 | 7.9 | 4.8 | 8.5 | 7.4 | Little worn. |
| Do | 164861 | do | 67 | 72 | 14.0 | 17.3 | 5.3 | 7.7 | 4.8 | 8.6 | 7.7 | Do. |
| B. E. A.: Kaimosi | 182589 | do | 65 | 82 | 14.2 | 17.2 | 5.5 | 7.7 | 4.8 | 8.8 | 7.4 | Moderately worn. |
| Do | 182590 | do | 68 | 81 | 14.5 | 17.6 | 5.5 | 7.9 | 4.8 | 9.3 | 7.8 | Do. |
| Do | 182591 | do | 63 | 86 | 14.5 | ..... | 5.5 | ..... | ..... | 9.0 | 7.8 | Do. |
| Do | 182595 | do | 67 | 76 | 14.2 | 16.3 | 5.4 | ..... | ..... | 8.3 | 7.1 | Do. |
| Do | 182594 | do | 65 | 73 | 13.5 | 16.5 | 5.4 | 7.7 | 4.5 | 8.8 | ..... | Do. |
| Do | 182596 | do | 70 | 82 | 14.5 | 17.4 | 5.6 | 8.0 | 5.0 | 9.1 | 7.5 | Do. |
| Do | 182597 | do | 68 | 84 | 14.0 | 17.2 | 5.5 | 8.2 | 4.8 | 8.8 | 7.7 | Do. |
| Do | 182598 | do | 67 | 81 | 14.3 | 17.4 | 5.4 | 7.7 | 4.6 | 9.0 | 7.7 | Little worn. |
| Do | 182599 | do | 67 | 77 | 14.4 | 17.3 | 5.5 | 8.2 | 4.8 | 8.8 | 7.5 | Moderately worn. |
| Do | 197963 | do | 64 | 81 | 14.5 | 17.3 | 5.9 | 8.1 | 5.1 | 9.3 | 7.6 | Do. |
| Do | 182587 | Female | 65 | 76 | 13.6 | ..... | 5.3 | ..... | ..... | 8.8 | 7.5 | Do. |
| Do | 182588 | do | 60 | 73 | 13.3 | ..... | 5.2 | ..... | ..... | 8.4 | ..... | Do. |
| Do | 182592 | do | 67 | 82 | 14.0 | 17.4 | 5.7 | 8.0 | 5.0 | 9.0 | 7.5 | Considerably worn. |
| Do | 182593 | do | 60 | 78 | 13.7 | 17.0 | 5.4 | 7.7 | 4.5 | 8.8 | 7.4 | Do. |
| Do | 197961 | do | 68 | 72 | 13.5 | ..... | 5.5 | 8.0 | 4.7 | 8.9 | 7.3 | Moderately worn. |
| Do | 197962 | do | 62 | 78 | 14.2 | 17.0 | 5.4 | 7.9 | 4.6 | 8.9 | 7.4 | Do. |
| *S. mundus.* | | | | | | | | | | | | |
| B. E. A.: Kijabe | [2] 16801 | Male | 70 | 59 | 12.0 | 16.4 | 5.2 | 8.3 | 5.1 | 8.5 | 7.2 | Little worn. |
| B. E. A.: Mount Kenia | 164141 | do | 70 | 58 | 12.6 | ..... | 5.2 | 8.0 | ..... | 8.5 | 7.2 | Moderately worn. |
| Do | 164142 | do | 69 | 58 | 12.0 | 16.6 | 5.3 | ..... | ..... | 8.7 | 7.3 | Little worn. |

[1] Type.

[2] Field Mus. Nat. History; type.

### Genus PACHYURA Sélys-Longchamps.

1839. *Pachyura* Sélys-Longchamps, Études de Micromamm., p. 32. (*P. etrusca.*)

The tiny equatorial African representatives of the 30-toothed musk shrews appear to be very rare or exceedingly difficult to capture. On the Rainey Expedition a single specimen was collected.

#### PACHYURA LIXA ÆQUATORIA Heller.

Plate 7, figs. 7, 8.

1912. *Pachyura lixa æquatoria* Heller, Smithsonian Misc. Coll., vol. 60, No. 12, p. 4. November 4. (Mt. Sagalla, Taita Hills, British East Africa; type in U. S. Nat. Mus.)

*Specimen.*—One, the type, from—
British East Africa: Mount Sagalla (Heller).

### Genus CROCIDURA Wagler.

1832. *Crocidura* Wagler, Isis, p. 275. (*C. leucodon.*)
1910. *Heliosorex* Heller, Smithsonian Misc. Coll., vol. 50, No. 15, p. 6, pl. 1. December 23. (*C. roosevelti.*)

The African musk shrews of this genus have recently been monographed by Mr. Guy Dollman.[1] Unfortunately this monograph is based almost entirely on material in the British Museum, and no attempt seems to have been made by the author to gather information about the type-specimens preserved in the American museums beyond that contained in the original description. A number of species described by American mammalogists, therefore, appear in the wrong groups in Dollman's paper, and while the information made available regarding the British Museum material is of the utmost importance and of great value to workers in this most difficult group, the paper is apt to be very misleading to one who has a small collection to work up without much material for comparison. It is furthermore very evident that the species groups in *Crocidura* are not yet carefully worked out and, as recognized, are not in any sense circumscribed sections of the genus.

The first installment of Dollman's paper appeared just as I had finished working over the specimens listed in the present report. Since the completion of his synopsis I have gone over carefully for a second time all of our material and have attempted, so far as I found it possible, to arrange the groups and species in the sequence adopted by him. Through the kindness of the Field Museum of Natural History, Chicago, I have had before me during this work the six type-specimens of East African species of *Crocidura* from that institution; and the American Museum of Natural History of New York has lent me the one East African type in its possession. The United

[1] On the African shrews belonging to the Genus *Crocidura*, Ann. and Mag. Nat. Hist., ser. 8, vol. 15, pp. 508–527, May; pp. 562–575, June, 1915; vol. 16, pp. 66–80, July; pp. 124–146, August; pp. 357–380, October; pp. 506–514, December, 1915; and vol. 17, pp. 188–209, February, 1916.

States National Museum collection contains 529 specimens of East African *Crocidura*, including 19 types. The total number of specimens examined during my work in determining the specimens listed is thus 536, including 26 types. In addition to this East African material, I have enjoyed the privilege of working out at the United States National Museum the collection of shrews made by the Chapin and Lang Expedition to Belgian Congo. This valuable material, in the American Museum of Natural History, includes 12 forms of *Crocidura*, and a total of 119 specimens. There are six types.[1] It is obvious that no successful monographic work on African species of *Crocidura* is possible without consulting American collections.

CROCIDURA NYANSÆ NYANSÆ Neumann.

1900. *Crocidura flavescens nyansæ* Neumann, Zool. Jahrbüch., Syst., Geog. Biol., vol. 13, p. 544. (Fort Lubwa, Usoga, Uganda; type in Berlin Museum.)

1915. *Crocidura nyansæ* Dollman, Ann. and Mag. Nat. Hist., ser. 8, vol. 15, p. 565. June.

1916. *Crocidura nyansæ nyansæ* Hollister, Bull. Amer. Mus. Nat. Hist., vol. 35, p. 664. October 21.

*Specimens.*—Nine, from the following localities:

Uganda: Butiaba, 1 (Loring); Hoima, 1 (Loring); Kampala, 2 (Loring).

British East Africa: Kaimosi, 1 (Heller); Kakumega, 1 (Heller); Kisumu, 1 (Heller); Sirgoit Lake, Guas Ngishu Plateau, 2, including 1 in alcohol (Heller).

There is much variation in color shown in this small series of skins from the region defined by Dollman as the range of typical *Crocidura nyansæ*, but no specimen is quite so dark as skins of frequent occurrence in the series of *Crocidura nyansæ kijabæ*. The Sirgoit Lake skin is the darkest adult in the series. A skin from Kaimosi is in the red phase (or pelage), common also to *kijabæ*. The two skins from Unyora (Butiaba and Hoima) are the palest in the series, and suggest intergradation with the *doriana*-like *Crocidura daphnia* of the east banks of the Nile in northern Uganda.

The following manuscript notes on the type-specimen of *Crocidura flavescens nyansæ* are on file in the National Museum and were made by Edmund Heller in Berlin:

Type No. A 5485, skin with skull; not marked type, but this is the female of which measurements are given in the original description. Color mummy-brown above, grayish below. Hind foot (skin), 19 millimeters. Skull: Condyloincisive length, 30; breadth of braincase, 12; upper tooth row, 13.5; length of mandible, including incisor, 18.5. Second unicuspid decidedly smaller than last.

A female of *C. n. nyansæ* collected by Heller at Kaimosi January 29 contained four embryos.

For measurements of specimens see table, page 44.

[1] See Bull. Amer. Mus. Nat. Hist., vol. 35, pp. 663-680. October 21, 1916.

CROCIDURA NYANSÆ KIJABÆ Allen.

1909. *Crocidura kijabæ* Allen, Bull. Amer. Mus. Nat. Hist., vol. 26, p. 173. March 19. (Kijabe, British East Africa; type in Amer. Mus. Nat. Hist.)
1910. *Crocidura nyansæ* Roosevelt, African Game Trails, Amer. ed., pp. 480 and 487; London ed., pp. 491 and 498.

*Specimens.*—Twenty-five, from localities as follows:

British East Africa: Aberdare Mountains, 11,000 feet, 1 (Heller); Laikipia, 1 (Heller); Mount Kenia, 3, including 2 in alcohol (Mearns, Loring, Heller); Mount Umengo, 1 (Heller); Naivasha Station, 17 (Loring); Nakutichu River, Naivasha Plains, 1 (Heller); Nyeri, 1 (Loring).

Considerable individual variation in color is shown in this series of skins. The upperparts range from clear, rich, reddish brown to almost blackish, and the bellies from light gray or buff to a shade almost as dark as the back. The type-specimen of *kijabæ*, kindly lent me by the American Museum, through Dr. J. A. Allen, is a skin of the darkest style, with the body almost unicolor. In the Naivasha series, however, are specimens of both extremes, and it is evident that color subspecies of this large shrew should not be recognized unless based on long series of specimens. Dollman, who probably had access to more skins of typical *nyansæ* than I have seen, recognized this race on the generally darker color of the series when compared with the average color in a series of *nyansæ*. On the basis of our collection alone I should not have recognized the subspecies, although there are several skins considerably darker than any specimen in our small series of *nyansæ* proper.

The single specimen from the Taita Hills (Mount Umengo) appears inseparable from examples in the Naivasha series, although its locality is much nearer to the type region of a related species not represented in our collection, *Crocidura martiensseni* Neumann, than to the nearest point from which we have skins of *C. n. kijabæ*. Just what is the relationship between *kijabæ* and *martiensseni* seems uncertain, but the Kilimanjaro form is certainly a considerably larger shrew than either *kijabæ* or typical *nyansæ*. Heller has made the following notes on the type specimen of *martiensseni* in Berlin:

Type ♀, alcoholic, No. 8909; Loc. Magrosso; specimen not marked type; skull extracted and cleaned. Skin, in alcohol, uniform mummy-brown, belly same as back; hind foot, 22 millimeters. Skull: Condyloincisive length, 33.5; breadth of braincase, 13.5; upper tooth row, 15; mandible, including incisor, 21.3.

Roosevelt, Heller, and Loring make the following remarks on the specimens of *C. n. kijabæ* collected by the Smithsonian African Expedition:[1]

Chiefly in the high country, near water courses; found round the edge of the forest, at Kenia and Kijabe. A fierce, carnivorous creature, preying on small rodents as

[1]African Game Trails, pp. 480 and 487. 1910.

*Measurements of shrews of the Crocidura nyansæ group.*

| Form and locality. | No. | Sex. | Head and body. | Tail vertebræ. | Hind foot, from dry skin. | Skull: Condylobasal length. | Maxillary breadth. | Breadth of braincase. | Depth of braincase (median). | Mandible. | Upper tooth row (entire). | Condition of teeth. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *C. n. nyansæ.* | | | | | | | | | | | | |
| Uganda: | | | | | | | | | | | | |
| Butiaba | 164896 | Female | 116 | 60 | 16.8 | 27.5 | 9.3 | ..... | 6.5 | 15.5 | 13.1 | Moderately worn. |
| Hoima | 164897 | ...do..... | 115 | 72 | 18.0 | ..... | 9.1 | 12.2 | 6.2 | 15.1 | 12.7 | Do. |
| B. E. A.: | | | | | | | | | | | | |
| Kaimosi | 182496 | ...do..... | 120 | 79 | 19.2 | 28.7 | 9.1 | 11.4 | 6.7 | 15.5 | 13.6 | Little worn. |
| Sirgoit Lake | 163960 | Male..... | 145 | 81 | 19.8 | 31.2 | 10.0 | 13.6 | 7.2 | 16.8 | 14.0 | Moderately worn. |
| Kisumu | 182494 | ...do..... | 120 | 82 | 19.7 | ..... | 9.4 | ..... | ..... | 16.0 | 13.7 | Little worn. |
| *C. n. kijabæ.* | | | | | | | | | | | | |
| B. E. A.: | | | | | | | | | | | | |
| Naivasha | 162023 | Male..... | 132 | 82 | 18.7 | 28.8 | 9.4 | 12.6 | 6.8 | 15.3 | 13.1 | Moderately worn. |
| Do | 162026 | ...do..... | 144 | 89 | 20.7 | 30.7 | 9.8 | 13.5 | 7.6 | 16.3 | 13.9 | Do. |
| Do | 162034 | ...do..... | 135 | 80 | 20.6 | 31.8 | 10.2 | 13.4 | 7.2 | 16.7 | 14.2 | Do. |
| Do | 162035 | ...do..... | 134 | 74 | 19.2 | 29.3 | 9.8 | 12.9 | 7.3 | 16.3 | 13.4 | Do. |
| Do | 162036 | ...do..... | 125 | 85 | 20.9 | 31.0 | 10.2 | 13.3 | 7.3 | 16.8 | 13.7 | Do. |
| Do | 162024 | Female | 133 | 81 | 19.3 | 28.5 | 9.7 | 12.6 | 6.9 | 16.5 | 13.0 | Do. |
| Do | 162025 | ...do..... | 113 | 87 | 20.5 | 28.5 | 9.5 | 12.5 | 6.7 | 16.2 | 13.5 | Unworn. |
| Do | 162029 | ...do..... | 131 | 77 | 19.0 | 29.0 | 9.0 | 12.0 | 6.4 | 15.1 | 13.5 | Little worn. |
| Do | 162031 | ...do..... | 136 | 91 | 20.9 | 29.9 | 10.2 | 13.3 | 7.3 | 16.5 | 13.6 | Do. |
| Do | 162032 | ...do..... | 123 | 72 | 19.8 | 28.4 | 9.4 | 12.3 | 6.7 | 15.7 | 12.8 | Do. |
| Do | 162037 | ...do..... | 144 | 89 | 20.3 | 30.4 | 10.0 | 13.4 | 7.0 | 16.6 | 13.6 | Do. |
| Do | 182492 | ...do..... | 115 | 83 | 20.3 | 29.7 | 9.3 | 12.6 | 6.7 | 15.7 | 13.2 | Unworn. |
| Kijabe | [1] 27890 | ...do..... | 123 | 78 | 19.2 | 29.0 | 9.8 | 12.0 | 6.4 | 15.9 | 14.0 | Little worn. |
| Laikipia | 163959 | Male..... | 150 | 88 | 21.3 | 32.4 | 10.5 | 12.9 | 7.1 | 18.4 | 14.8 | Moderately worn. |
| Mount Kenia | 163969 | ...do..... | 142 | 88 | 19.5 | 29.4 | 9.4 | 12.3 | 6.5 | 16.4 | 13.6 | Do. |
| Mount Umengo | 182493 | ...do..... | 115 | 81 | 18.6 | 28.0 | 9.3 | 12.1 | 6.2 | 15.4 | 13.0 | Do. |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *C. daphnia.* | | | | | | | | | | | |
| Uganda: Gondokoro | [1] 164898 | Female | 142 | 79 | 19.0 | ..... | 9.4 | ..... | ..... | 15.5 | 13.6 | Moderately worn. |
| *C. sururæ.* | | | | | | | | | | | | |
| Lado: | | | | | | | | | | | | |
| Rhino Camp | [2] 164637 | Male | 111 | 64 | 17.0 | 27.1 | 8.8 | 11.8 | 6.0 | 14.4 | 12.9 | Unworn. |
| Do | 164890 | ...do | 129 | 62 | 17.7 | 28.8 | 8.9 | 11.0 | 6.5 | 16.1 | 12.7 | Moderately worn. |
| Do | 164883 | Female | 115 | 70 | 16.8 | 26.6 | 8.5 | 11.0 | 6.0 | 14.5 | 12.4 | Considerably worn. |
| Do | 164889 | ...do | 112 | 64 | 16.7 | 25.9 | 8.5 | 11.1 | 5.9 | 14.4 | 12.4 | Little worn. |
| Do | 164891 | ...do | 107 | 70 | 16.0 | 25.6 | 8.4 | 10.8 | 5.8 | 14.4 | 12.1 | Do. |
| Do | 164892 | ...do | 102 | 53 | 15.7 | 25.9 | 8.9 | 11.6 | 6.0 | 14.3 | 11.6 | Do. |
| Do | 164893 | ...do | 114 | 65 | 16.0 | 25.9 | 8.4 | 11.2 | 6.0 | 13.9 | 12.4 | Do. |
| Do | 164894 | ...do | 115 | 59 | 16.5 | 26.7 | 9.0 | 11.3 | 6.0 | 14.8 | 12.8 | Moderately worn. |
| Do | 164895 | ...do | 99 | 61 | 15.4 | 24.8 | 8.5 | 10.6 | 5.7 | 13.9 | 12.0 | Unworn. |

[1] Amer. Mus. Nat. Hist., type.

[2] Type.

well as insects; habitually ate mice, rats, or shrews which it found in the traps, and would then come back and itself be readily trapped (*Roosevelt* and *Heller*).

Giant shrews were common at Lake Naivasha, where most of them were caught in the thick reeds and rank grass bordering the lake. One was taken at Nyeri and another on Mount Kenia at an altitude of 10,700 feet. They seemed to be as much diurnal as nocturnal, and were captured in traps baited with rolled oats, dried apple, and raw meat. They inhabited the dense parts of the thickets, where the foliage had to be partèd and a clearing made for the traps. These localities were the home of a large rat, and many of the rats captured were decapitated or partly eaten by animals that probably were giant shrews. A shrew captured alive was very ferocious and would seize upon anything that came within its reach. When fully excited and lifted into the air by its tail, it would emit a loud shrill chirping note (*Loring*).

For measurements see page 44.

**CROCIDURA DAPHNIA Hollister.**

Plate 7, figs. 3, 4.

1910. *Crocidura sururæ* Heller, Smithsonian Misc. Coll., vol. 56, No. 15, p. 3. December 23. (Part, specimen from Gondokoro; not *C. sururæ* Heller, Smithsonian Misc. Coll., vol. 56, No. 15, p. 2.)

1915. *Crocidura sururæ* Dollman, Ann. and Mag. Nat. Hist., ser. 8, vol. 15, p. 571. June. (Part, specimens from Wadelai and Mongalla; not of Heller.)

1916. *Crocidura daphnia* Hollister, Smithsonian Misc. Coll., vol. 66, No. 8, p. 1. May. (Gondokoro, Uganda; type in U. S. Nat. Mus.)

*Specimen.*—One, the type, as follows:

Uganda: Gondokoro (Loring).

This species is quite different from the related *C. sururæ* of Lado and is evidently separated from the latter by the barrier of the Nile.

It is in a way a connecting link between *C. doriana* Dobson of Abyssinia and *C. nyansæ* of Uganda, and may prove to intergrade with both. From *sururæ* of the western side of the Nile this species may readily be distinguished by its larger size and paler coloration.

CROCIDURA SURURÆ Heller.

Plate 7, figs. 11, 12.

1910. *Crocidura sururæ* Heller, Smithsonian Misc. Coll., vol. 56, No. 15, p. 2. December 23. (Rhino Camp, Lado Enclave; type in U. S. Nat. Mus.)

*Specimens.*—Ten, as follows:

Lado: Rhino Camp (Loring).

This shrew is a member of the *nyansæ* group and is chiefly distinguished from *C. daphnia* of the east side of the Nile by its smaller size and darker, richer coloration. It is apparently confined to the western side of the Nile. The specimen from Gondokoro, which was placed with *sururæ* by Heller at the time of his publication of the species, has since become the type-specimen of *C. daphnia*.

For measurements of specimens of *C. daphnia* and *C. sururæ* see table, page 45.

CROCIDURA HINDEI Thomas.

1904. *Crocidura hindei* Thomas, Ann. and Mag. Nat. Hist., ser. 7, vol. 14, p. 237. September. (Machakos, British East Africa; type in British Museum.)

1910. *Crocidura fisheri* Roosevelt, African Game Trails, Amer. ed., p. 479; London ed., p. 491. (Part; not *C. fischeri* Pagenstecher.)

*Specimens.*—Three, from localities as follows:

British East Africa: Juja Farm, 2, including one in alcohol (Loring); Ulukenia Hills, 1 (Loring).

The Ulukenia Hills specimen, an adult male, shows both new and old pelages in about equal areas; one specimen from Juja Farm is immature and is much darker in color, above and below. The *Crocidura "fisheri"* listed in Appendix B of Roosevelt's African Game Trails refers in part to this species and partly to *C. jacksoni* Thomas. There is no specimen of *C. fischeri* in the collection.

For measurements see table, page 48.

CROCIDURA LUTRELLA Heller.

Plate 7, figs. 9, 10.

1910. *Crocidura lutrella* Heller, Smithsonian Misc. Coll., vol. 56, No. 15, p. 4. December 23. (Rhino Camp, Lado Enclave; type in U. S. Nat. Mus.)

*Specimens.*—Fifteen, including four in alcohol, from—

Lado: Rhino Camp (Loring, Heller).

This species is related to *Crocidura parvipes* Osgood from Voi, British East Africa, and to *C. p. nisa* Hollister from Kibabe, Kisumu, and differs from them chiefly in its paler color. I believe that all

three forms will eventually be found to intergrade, and that all may prove to be subspecies of *Crocidura fulvaster* (Sundevall).[1] In fact, I can not distinguish specimens of *lutrella* from the description of *fulvaster*, and would not be surprised if the two names referred to the same form. The type-locality of *fulvaster* is on the Bahr el Abiad (White Nile). This locality is some distance from the region where *lutrella* was collected, and I do not feel justified in treating the two names as synonyms without specimens of *fulvaster* for actual comparison. Dollman placed *fulvaster* among his undetermined species,[2] but suggests its identity with *C. sericea* Sundevall, a member of the *hindei* group.

For measurements of specimens see table, page 48.

#### CROCIDURA PARVIPES PARVIPES Osgood.

1910. *Crocidura parvipes* Osgood, Field Mus., Zool. Ser., vol. 10, No. 3, p. 19. April 7. (Voi, British East Africa; type is Field Mus. Nat. Hist.)

*Specimen.*—One in alcohol from—

British East Africa: Fort Hall (Loring).

This specimen, though clearly referable to *C. parvipes parvipes*, is somewhat intermediate in characters between true *parvipes* and *C. p. nisa*.

In Dollman's monograph of the African species of *Crocidura* this species is placed in the *jacksoni* group. The type-specimen, which I have before me, thanks to the authorities of the Field Museum, shows clearly that the species is not closely related to *jacksoni*, but belongs in a section of the *hindei* group containing the three small forms, *lutrella*, *parvipes*, and *nisa*.

#### CROCIDURA PARVIPES NISA Hollister.

Plate 7, figs. 17, 18.

1916. *Crocidura parvipes nisa* Hollister, Smithsonian Misc. Coll., vol. 66, No. 8, p. 2. May. (Kibabe, Kisumu, British East Africa; type in U. S. Nat. Mus.)

*Specimen.*—One from—

British East Africa: Kibabe (Heller).

The type-specimen, collected January 20, contained five embryos. This shrew is close to *Crocidura parvipes* Osgood. It is somewhat darker in color than the type of *parvipes* and very much darker than any skin in the series of 11 specimens of *C. lutrella* of Lado. The single specimen in our collection which I have referred to *Crocidura parvipes parvipes* is clearly intermediate between *parvipes* and *nisa*.

For measurements of specimens of *C. parvipes*, see page 48.

[1] Kongl. Vet.-Acad. Handl., 1842, p. 172. 1843.

[2] Ann. and Mag. Nat. Hist., ser. 8, vol. 17, p. 208. February, 1916.

*Measurements of shrews of the Crocidura hindei-fischeri group.*

| Form and locality. | No. | Sex. | Head and body. | Tail vertebræ. | Hind foot, dry. | Skull: Condylobasal length. | Maxillary breadth | Breadth of braincase. | Depth of braincase (median). | Mandible. | Upper tooth row (entire). | Condition of teeth. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *C. hindei.* | | | | | | | | | | | | |
| B. E. A.: | | | | | | | | | | | | |
| Ulukenia Hills | 164047 | Male | 92 | 47 | 14.2 | 23.3 | 7.5 | 9.8 | 5.0 | 12.7 | 10.3 | Moderately worn. |
| Juja Farm | 161698 | Female | 98 | 47 | 13.0 | 22.6 | ..... | 9.8 | 5.4 | 12.3 | 10.3 | Unworn. |
| *C. lutrella.* | | | | | | | | | | | | |
| Lado: Rhino Camp | [1]164640 | Male | 80 | 40 | 12.0 | 20.1 | 6.8 | 9.1 | 5.4 | 11.1 | 9.0 | Unworn. |
| Do | 164866 | ...do | 88 | 42 | 11.0 | 19.2 | 6.7 | 8.8 | 4.9 | 10.6 | 8.5 | Little worn. |
| Do | 164869 | ...do | 83 | 38 | 12.0 | 20.7 | 7.0 | 9.3 | 5.4 | 11.4 | 9.3 | Unworn. |
| Do | 164870 | ...do | 85 | 39 | 11.5 | 19.8 | 7.0 | 8.9 | 4.8 | 11.1 | 8.8 | Do. |
| Do | 164873 | ...do | 85 | 41 | 11.8 | 20.0 | 7.1 | 9.3 | 5.4 | 10.8 | 8.8 | Much worn. |
| Do | 164874 | ...do | 81 | 38 | 11.5 | 20.2 | 7.2 | 9.0 | 5.3 | 10.9 | 8.9 | Considerably worn. |
| Do | 164875 | ...do | 81 | 37 | 11.5 | 20.5 | 6.8 | 9.2 | 5.0 | 11.1 | 9.4 | Little worn. |
| Do | 164867 | Female | 71 | 40 | 11.0 | 19.2 | 6.4 | ..... | ..... | 10.6 | 8.5 | Moderately worn. |
| Do | 164872 | ...do | 75 | 34 | 11.3 | 20.2 | 6.3 | 8.8 | 5.1 | 11.0 | 8.7 | Do. |
| *C. p. parvipes.* | | | | | | | | | | | | |
| B. E. A.: | | | | | | | | | | | | |
| Voi | [2]16890 | Male | 84 | 38 | 11.3 | ..... | 7.1 | 9.5 | 5.1 | 11.2 | 8.7 | Moderately worn. |
| Fort Hall | 165517 | Female | ..... | ..... | ..... | 19.4 | 6.7 | 8.6 | 5.0 | 10.7 | 8.5 | Much worn. |
| *C. p. nisa.* | | | | | | | | | | | | |
| B. E. A.: Kibabe | [1]82440 | Female | 80 | 38 | 11.3 | 19.6 | 6.9 | 9.0 | 5.3 | 11.0 | 8.9 | Moderately worn. |
| *C. percivali.* | | | | | | | | | | | | |
| B. E. A.: Lakiundu River | 182576 | Male | 80 | 48 | 12.0 | 20.6 | 6.3 | 9.0 | 4.8 | 10.7 | 9.0 | Little worn. |
| Do | 182577 | Female | 80 | 48 | 12.2 | ..... | 6.1 | ..... | ..... | 10.3 | 8.8 | Moderately worn. |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *C. suahelae.* | | | | | | | | | | | |
| B. E. A.: | | | | | | | | | | | |
| Mazeras | [1]181815 | Male | 110 | 69 | 16.0 | 25.4 | 8.1 | 10.7 | 5.8 | 13.5 | 11.4 | Little worn. |
| Do | 182555 | ...do | 93 | 60 | 14.6 | 22.7 | 7.8 | 10.2 | 5.4 | 12.6 | 10.5 | Unworn. |
| Do | 182558 | ...do | 105 | 64 | 15.7 | 24.6 | 8.2 | 10.7 | 5.7 | 13.2 | 10.9 | Little worn. |
| Do | 182559 | ...do | 105 | 58 | 15.1 | 23.8 | 8.1 | 10.5 | 5.6 | 12.7 | 10.5 | Moderately worn. |
| Do | 182561 | ...do | 107 | 67 | 15.3 | 25.2 | 8.5 | 10.8 | 5.9 | 13.4 | 11.2 | Do. |
| Do | 182566 | ...do | 102 | 63 | 14.8 | 24.4 | 8.0 | 10.4 | 5.6 | 12.4 | 10.7 | Little worn. |
| Do | 182568 | ...do | 105 | 56 | 14.9 | 24.5 | 7.9 | 10.7 | 5.5 | 12.6 | 10.8 | Do. |
| Do | 182569 | ...do | 95 | 61 | 14.8 | 23.2 | 8.0 | 10.2 | 5.3 | 12.3 | 10.5 | Do. |
| Do | 182570 | ...do | 100 | 57 | 15.4 | 24.3 | 8.1 | 10.7 | 5.9 | 12.6 | 10.5 | Moderately worn. |
| Do | 182571 | ...do | 98 | 50 | 14.8 | 23.9 | 8.0 | 10.9 | 6.0 | 12.8 | 10.6 | Little worn. |
| Do | 182572 | ...do | 95 | 52 | 15.2 | 23.2 | 7.9 | 10.6 | 5.9 | 12.2 | 10.3 | Do. |
| Do | 182573 | ...do | 102 | 58 | 15.6 | 24.1 | 7.9 | 11.0 | 5.7 | 12.2 | 10.2 | Do. |
| Do | 182574 | ...do | 95 | 52 | 14.7 | 22.3 | 7.8 | 9.7 | 5.3 | 11.8 | 10.3 | Unworn. |
| Do | 182556 | Female | 115 | 60 | 14.7 | 24.3 | 8.1 | 10.5 | 5.8 | 12.7 | ..... | Moderately worn. |
| Do | 182560 | ...do | 98 | 65 | 15.8 | 24.2 | 8.0 | 10.4 | 5.7 | 12.6 | 11.0 | Unworn. |
| Do | 182562 | ...do | 105 | 60 | 14.5 | 23.9 | 7.9 | 10.0 | 5.4 | 13.2 | 10.7 | Little worn. |
| Do | 182563 | ...do | 102 | 56 | 14.7 | 23.3 | 7.8 | 10.1 | 5.6 | 12.4 | 10.8 | Unworn. |
| Do | 182564 | ...do | 95 | 58 | 15.0 | 23.3 | 7.9 | 10.1 | 5.4 | 12.7 | 10.6 | Do. |
| Do | 182567 | ...do | 90 | 55 | 15.1 | 22.6 | 7.5 | 10.0 | 5.4 | 12.7 | 10.4 | Do. |
| Changamwe | 164044 | ...do | ..... | ..... | 14.6 | 22.6 | 7.8 | 9.8 | 5.6 | 12.5 | 10.2 | Do. |
| *C. simiolus.* | | | | | | | | | | | |
| B. E. A.: | | | | | | | | | | | |
| Kaimosi | 182497 | Male | 115 | 80 | 17.1 | 26.2 | 8.5 | 11.1 | 6.3 | 14.1 | 12.2 | Little worn. |
| Do | 182495 | Female | 100 | 73 | 17.2 | 25.9 | 8.4 | 11.2 | 5.9 | 15.1 | 12.3 | Unworn. |
| Kibabe | 182471 | ...do | 100 | ..... | 16.6 | 25.2 | 8.4 | 10.6 | 5.9 | 13.5 | 12.0 | Do. |
| Kisumu | 7959 | ...do | 113 | 60 | 17.0 | 26.1 | 8.3 | 11.1 | 6.4 | 13.7 | 12.3 | Little worn. |
| *C. mutesæ.* | | | | | | | | | | | |
| Uganda: Kampala | [3]164636 | ...do | 115 | 64 | 16.0 | 24.6 | 8.0 | 11.0 | 6.2 | 13.4 | 11.3 | Moderately worn. |

[1] Type. [2] Field Mus. Nat. Hist., type. [3] Type; erroneously given as 174636 in original description.

CROCIDURA PERCIVALI Dollman.

1915. [*Crocidura*] *percivali* Dollman, Ann. and Mag. Nat. Hist., ser. 8, vol. 15, p. 513. May. (Jombeni Range, British East Africa; type in British Museum.)

1915. *Crocidura percivali* Dollman, Ann. and Mag. Nat. His., ser. 8, vol. 16, p. 126. August.

*Specimens.*—Two, from—

British East Africa: Lakiundu River (Heller).

The shrew described by Osgood as *Crocidura xantippe*,[1] type-locality Voi, was placed by Dollman in the *jacksoni* group, but it is not closely related to *jacksoni* or its allies, and agrees with the members of the *hindei-fischeri* group in all essential characters—coloration; the long narrow rostrum; strong, wide maxillary processes; narrow posterior border of the bony palate; and the enlarged first upper unicuspid. It is in fact very closely related to *Crocidura percivali*, but is larger and lighter colored, with larger skull and teeth. Another East African shrew not represented in the National Museum collection is *Crocidura voi* Osgood.[2] While not closely related to any species known to me, it has, nevertheless, many decided characteristics of the *hindei* group, but differs in its slaty coloration, short, light-colored tail, and massive dentition. The type-specimens of *C. xantippe* and *C. voi* have been lent me by the Field Museum of Natural History, Chicago, in connection with this work.

For measurements of specimens see page 48.

CROCIDURA SUAHELÆ Heller.

Plate 7, figs. 15, 16.

1912. *Crocidura suahelæ* Heller, Smithsonian Misc. Coll., vol. 60, No. 12, p. 6. November 4. (Mazeras, British East Africa; type in U. S. Nat. Mus.)

*Specimens.*—Twenty-five, from localities as follows:

British East Africa: Changamwe, 1 (Mearns): Mazeras, 24, including 3 in alcohol (Heller).

This pale coast species is, following Dollman, here placed in the *fischeri* group, although it and its two allies (*simiolus* and *mutesæ*) certainly show many characteristics of the *nyansæ* group, some species of which it approaches in size. It is only slightly smaller than *C. sururæ* of Lado. The two smaller upper unicuspids are virtually of the same size, and either the second or the third may, in certain specimens, appear the larger. No specimen in the series shows anything approaching the relatively smaller third upper unicuspid as in the type of *Crocidura voi*, where the difference is very pronounced, the second being nearly twice the size of the third.

[1] Field Mus. Nat. Hist., Zool. Ser., vol. 10, No. 3, p. 19. April 7, 1910.

[2] Field Mus. Nat. Hist., Zool. Ser., vol. 10, No. 3, p. 18. April 7, 1910.

The musky odor of specimens, even of dried skins collected several years, is particularly noticeable in this species.

For table of measurements see page 49.

CROCIDURA SIMIOLUS Hollister.

Plate 7, figs. 13, 14.

1916. *Crocidura simiolus* HOLLISTER, Smithsonian Misc. Coll., vol. 66, No. 8, p. 3. May. (Kisumu, British East Africa; type in U. S. Nat. Mus.)

*Specimens.*—Four, from the following localities:

BRITISH EAST AFRICA: Kaimosi, 2 (Heller); Kibabe, 1 (Heller); Kisumu, 1 (Turner).

The range of this species seems somewhat restricted, as it appears in the collection only from the vicinity of Kavirondo Gulf, where it was captured in localities with the larger *Crocidura nyansæ nyansæ*. Externally it greatly resembles certain specimens of *nyansæ* but can instantly be separated from them by its smaller skull. It is nearest related to *C. suahelæ* and C. *mutesæ*, but is slightly larger than either. In color it is very similar to the darker specimens of *suahelæ*, and in the red phase is almost indistinguishable externally from the type-specimen of *mutesæ*.

CROCIDURA MUTESÆ Heller.

Plate 8, figs. 1, 2.

1910. *Crocidura mutesæ* HELLER, Smithsonian Misc. Coll., vol. 56, No. 15, p. 3. December 23. (Kampala, Uganda; type in U. S. Nat. Mus.)

*Specimen.*—One, the type, from—

UGANDA: Kampala (Loring).

This shrew was originally described as a member of the *turba* group, and was so placed by Dollman in his synopsis of the African species of *Crocidura*. The two specimens recorded with the type from Uganda, in the original description, are, indeed, *Crocidura turba zaodon*, but the type itself is not a member of the same group and proves to be closely related to *Crocidura suahelæ* and to the Kavirondo *C. simiolus*. The skull of the type-specimen of *mutesæ* is scarcely distinguishable from skulls of *suahelæ*, but in color the skin is very different, and looks almost exactly like the reddish-brown specimens of *nyansæ* and *simiolus*.

For measurements of specimens of *C. simiolus* and *C. mutesæ* see table, page 49.

CROCIDURA TURBA NILOTICA Heller.

Plate 8, figs. 3, 4.

1910. *Crocidura nilotica* HELLER, Smithsonian Misc. Coll., vol. 56, No. 15, p. 3. December 23. (Rhino Camp, Lado Enclave; type in U. S. Nat. Mus.)

1916. *Crocidura turba nilotica* HOLLISTER, Bull. Amer. Mus. Nat. Hist., vol. 35, p. 664. October 21.

*Specimens.*—Fifteen, including seven in alcohol, from:

*Measurements of specimens of the subspecies of Crocidura turba.*

| Form and locality. | No. | Sex. | Head and body. | Tail vertebræ. | Hind foot, dry. | Skull: Condylobasal length. | Maxillary breadth | Breadth of brain case. | Depth of brain case (median). | Mandible. | Upper tooth row (entire). | Condition of teeth. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *C. t. nilotica.* | | | | | | | | | | | | |
| Lado: | | | | | | | | | | | | |
| Rhino Camp | 164882 | Male | 93 | 52 | 16.0 | 23.0 | 7.5 | 10.3 | 5.7 | 12.6 | 10.6 | Unworn. |
| Do | 164884 | do | 97 | 52 | 15.0 | 22.8 | 7.0 | 9.5 | 5.9 | 12.3 | 10.5 | Do. |
| Do | 164886 | do | 96 | 50 | 15.0 | 22.8 | 7.0 | 10.2 | 5.8 | 11.9 | 10.0 | Moderately worn. |
| Do | 164887 | do | 102 | 51 | 15.0 | 22.6 | 7.2 | 10.0 | 5.9 | 12.0 | 10.1 | Do. |
| Do | 1 164638 | Female | 92 | 48 | 14.5 | 22.0 | 7.4 | 10.1 | 6.0 | 12.0 | 10.2 | Do. |
| Do | 164885 | do | 88 | 51 | 14.0 | 21.2 | 6.6 | 9.3 | 5.2 | 11.5 | 9.4 | Do. |
| *C. t. zaodon.* | | | | | | | | | | | | |
| Uganda: | | | | | | | | | | | | |
| Hoima | 164879 | Male | 101 | 60 | 15.5 | 23.7 | 7.2 | 10.0 | 5.9 | 12.7 | 10.5 | Moderately worn. |
| Ledgus | 164903 | do | 107 | 65 | 16.5 | 24.1 | 7.7 | 10.3 | 5.7 | 13.0 | 10.8 | Little worn. |
| Kabula Muliro | 164877 | Female | 97 | 54 | 15.5 | 23.7 | 7.5 | 9.8 | 5.8 | 12.6 | 10.5 | Do. |
| Butiaba | 164878 | do | 90 | 51 | 15.0 | 21.6 | 7.3 | 9.8 | 5.7 | 11.9 | 10.1 | Do. |
| Gondokoro | 164902 | do | 104 | 57 | 15.0 | 23.6 | 7.4 | 10.5 | 5.7 | 12.8 | 9.9 | Much worn. |
| B. E. A.: | | | | | | | | | | | | |
| Guas Ngishu | 164041 | Male | 95 | 51 | 14.5 | 21.8 | 7.0 | 9.8 | 5.9 | 11.4 | 10.0 | Little worn. |
| Do | 164043 | do | 100 | 55 | 16.0 | 22.7 | 7.1 | 10.0 | 5.9 | 11.8 | 10.0 | Do. |
| Kakumega | 182475 | do | 90 | 54 | 15.0 | 22.1 | 7.2 | 9.9 | 5.8 | 12.8 | 10.0 | Moderately worn. |
| Kibabe | 182472 | do | 92 | 60 | 16.0 | 23.5 | 7.7 | 10.3 | 5.9 | 12.8 | 10.5 | Do. |
| Do | 182470 | Female | 85 | 56 | 14.5 | 21.5 | 6.8 | 9.7 | 5.7 | 11.8 | 9.8 | Little worn. |
| Kisumu | 182473 | | 95 | 56 | 15.0 | 23.0 | 7.3 | 9.9 | 6.0 | 12.0 | 10.3 | Moderately worn. |
| Kaimosi | 182537 | Male | 95 | 58 | 16.0 | 22.9 | 7.0 | 10.1 | 5.7 | 12.2 | 9.9 | Do. |
| Do | 182543 | do | 90 | 54 | 15.0 | 22.1 | 7.3 | 9.8 | 5.8 | 11.9 | 9.8 | Little worn. |
| Do | 182544 | do | 95 | 60 | 15.5 | 23.4 | 7.4 | 10.1 | 5.7 | 12.7 | 10.8 | Moderately worn. |
| Do | 182482 | Female | 95 | 54 | 14.5 | 21.7 | 7.1 | 10.0 | 5.4 | 12.0 | 10.0 | Do. |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Do | 182533 | ...do.... | 90 | 59 | 15.0 | 23.0 | 7.3 | 9.8 | 5.8 | 12.3 | 10.6 | Do. |
| Do | 182539 | ...do.... | 98 | 60 | 15.5 | 22.9 | 7.4 | 10.1 | 5.9 | 12.5 | 10.3 | Do. |
| Do | 182540 | ...do.... | 85 | 52 | 15.0 | 21.7 | 7.3 | 9.8 | 5.7 | 11.3 | 9.6 | Little worn. |
| Do | 182541 | ...do.... | 87 | 51 | 14.5 | 21.4 | 6.9 | 9.7 | 5.8 | 11.6 | 9.8 | Do. |
| Naivasha Plains | 182529 | Male.... | 88 | 45 | 15.5 | 22.8 | 7.5 | 10.3 | 6.1 | 12.0 | 10.5 | Do. |
| Do | 182530 | ...do.... | 95 | 61 | 16.0 | 23.2 | 7.4 | 10.4 | 6.2 | 12.5 | 10.6 | Unworn. |
| Nairobi | [2] 16929 | ...do.... | 98 | 60 | 16.0 | 23.5 | 7.3 | 10.2 | 5.9 | 12.2 | 10.7 | Little worn. |
| Nyeri | 182525 | ...do.... | 90 | 62 | 16.0 | 23.1 | 7.4 | 9.8 | ..... | 12.5 | 10.6 | Unworn. |
| Mount Kenia | 164039 | ...do.... | 97 | 56 | 16.5 | 23.1 | 7.5 | 10.2 | 5.7 | 12.4 | 10.8 | Do. |
| Aberdare Mountains | 182526 | ...do.... | 80 | 50 | 14.0 | ..... | 6.7 | ..... | ..... | 11.9 | 9.9 | Little worn. |
| Do | 182528 | ...do.... | 93 | 57 | 16.0 | 23.6 | 7.5 | 10.6 | 6.3 | 12.7 | 10.5 | Do. |
| Do | 182527 | Female.. | 85 | 48 | 14.5 | 21.9 | 7.1 | ..... | ..... | 11.7 | 9.9 | Moderately worn. |
| Isiola River | 182450 | Male.... | 100 | 52 | 15.5 | 23.0 | 7.1 | 10.1 | 5.9 | 12.3 | 10.2 | Do. |
| Lakiunda River | 182451 | ...do.... | 100 | 55 | 15.5 | 22.9 | 7.4 | 9.9 | 5.6 | 12.4 | 10.2 | Do. |
| Do | 182452 | ...do.... | 100 | 57 | 16.0 | ..... | 7.3 | ..... | ..... | 12.4 | 10.5 | Unworn. |
| Do | 182453 | ...do.... | ..... | ..... | 15.0 | ..... | 7.1 | ..... | ..... | 12.3 | 9.9 | Considerably worn. |
| Do | 182454 | ...do.... | 85 | 59 | 15.5 | ..... | 7.2 | ..... | ..... | 12.3 | 10.1 | Moderately worn. |
| Do | 182466 | ...do.... | 90 | 59 | 15.5 | 22.1 | 7.1 | 9.8 | 5.3 | 11.7 | 10.2 | Little worn. |
| Do | 182580 | ...do.... | ..... | ..... | ..... | 22.0 | 7.1 | 9.7 | 5.7 | 11.9 | 9.4 | Much worn. |
| Do | [3] 181816 | Female.. | 95 | 57 | 15.5 | 22.0 | 7.2 | 9.8 | 5.5 | 12.0 | 10.0 | Little worn. |
| Archer's Post | 182467 | Male.... | 100 | 52 | 15.5 | ..... | ..... | ..... | ..... | 12.2 | 10.2 | Do. |
| Mount Mbololo | 182461 | ...do.... | 85 | 50 | 15.0 | 22.2 | 6.8 | 9.8 | 5.9 | 12.0 | 10.2 | Moderately worn. |
| Mount Umengo | 182462 | ...do.... | 90 | 64 | 16.0 | 23.4 | 7.3 | 10.5 | 6.0 | 12.5 | 10.4 | Do. |
| Sagalla | 182463 | ...do.... | 85 | 55 | 15.5 | 22.3 | 6.8 | 9.8 | 5.6 | 12.2 | 10.1 | Do. |
| Do | 182464 | Female.. | 95 | 61 | 15.5 | 22.5 | 6.8 | 9.8 | 5.9 | 12.4 | 10.3 | Do. |
| Do | 182465 | ...do.... | 85 | 60 | 14.5 | 21.6 | 6.5 | 9.4 | 5.7 | 11.8 | 9.8 | Little worn. |
| Do | 182469 | Male.... | 90 | 62 | 16.0 | 22.8 | 7.1 | 10.0 | 6.0 | 12.3 | 10.5 | Do. |

[1] Type.

[2] Field Mus. Nat. Hist., type.

[3] Type of *Crocidura turba lakiundæ*,

Lado: Rhino Camp (Loring, Mearns).

This small, blackish race of *turba* is apparently confined to the western side of the Nile; all the skins from the Uganda shores are referable to the wide ranging subspecies *zaodon*.

CROCIDURA TURBA ZAODON Osgood.

Plate 8, figs. 5, 6.

1910. *Crocidura turba zaodon* Osgood, Field Mus., Zool. Ser., vol. 10, No. 3, p. 21. April 7. (Nairobi, British East Africa; type in Field Mus. Nat. Hist.)

1910. *Crocidura turba provocax* Thomas, Ann. and Mag. Nat. Hist., ser. 8, vol. 6, p. 112. July. (Aberdare Mts., British East Africa; type in British Museum.)

1912. *Crocidura turba lakiundæ* Heller, Smithsonian Misc. Coll., vol. 60, No. 12, p. 6. November 4. (Lakiunda River, near its junction with the Northern Guaso Nyiro River, British East Africa; type in U. S. Nat. Mus.)

*Specimens.*—Ninety-nine, including 46 in alcohol, from localities as follows:

Uganda: Butiaba, 4 (Loring, Heller); Gondokoro, 1 (Loring); Hoima, 1 (Loring); Kampala, 1 (Loring); Kabula Muliro, 2 (Loring); Ledgus, 1 (Loring).

British East Africa: Aberdare Mountains, 5 (Heller); Archer's Post, Northern Guaso Nyiro, 2 (Heller); Fort Hall, 2 (Loring); Isiola River, head, 2 (Heller); Kaimosi, 32 (Heller); Kakumega, 1 (Heller); Kibabe, 2 (Heller); Kisumu, 1 (Heller); Laikipia Plateau, 15 miles north of Nyeri, 1 (Heller); Lakiunda River, 11 (Heller); Lukosa River, 1 (Heller); Meru, 1 (Heller); Mount Kenia, west slope, 11 (Heller, Loring); Mount Mbololo, 1 (Heller); Mount Sagalla, 4 (Heller); Mount Umengo, 1 (Heller); Naivasha Plains, 2 (Heller); Nyangnori, 1 (Heller); Nzoia River, Guas Ngishu Plateau, 4 (Heller); Sirgoit, 2 (Heller); Sirgoit Lake, 2 (Heller).

A careful study of this excellent suite of specimens from widely separated parts of Uganda and British East Africa shows that while there is considerable variation in size and color these variations are by no means geographic, and that only one subspecies can be recognized from within this area. A moment's study of the accompanying table of measurements will show that length of tail and size of hind foot are characters of no importance for separating races in the Aberdares or Northern Guaso Nyiro from true *zaodon* of Nairobi or from the specimens taken in Uganda. The Gondokoro and Ledgus, Uganda, specimens can be almost exactly matched by skins in the series from the mountains in extreme southeastern British East Africa (Sagalla, Umengo, and Mbololo). While the majority of the skins are in the lighter brownish pelage usual to the race, there are specimens in the fresh, rich, dark, seal-brown coat (like the type) from many localities. Two alcoholic specimens from Butiaba,

Uganda, are chiefly in an old, decidedly reddish coat, quite unlike others, but show the new dark coat on head and shoulders.

The two specimens from Uganda (Gondokoro and Kampala) referred by Heller [1] to his *Crocidura mutesæ* clearly belong here rather than with the type of *mutesæ;* and the specimens from Uganda (Butiaba, Hoima, and Kabula Muliro) which were referred by Heller [2] to *nilotica* seem to me to belong without question to *zaodon,* though approaching the smaller and darker *nilotica* in one character, the shortness of the fur.

Still another East African race of *turba* has been described by Dollman [3] from Kirui, Mount Elgon, as *Crocidura turba kempi.* No topotypes of this form are in our collection, but specimens from the Guas Ngishu Plateau, which should represent it, are indistinguishable from *zaodon.*

A female collected by Heller at Kibabe, January 20, contained three embryos; and one from Kaimosi, January 29, two embryos.

For measurements of specimens of the subspecies of *C. turba* see table, page 52.

### CROCIDURA FUMOSA FUMOSA Thomas.

Plate 8, figs. 7, 8.

1904. *Crocidura fumosa* Thomas, Ann. and Mag. Nat. Hist., ser. 7, vol. 14, p. 238. September. (Western slope of Mt. Kenia, British East Africa; type in British Museum.)

1910. *Crocidura fumosa* Roosevelt, African Game Trails, Amer. ed., pp. 474 and 479; London ed., pp. 486 and 491.

1910. *Crocidura alchemillæ* Heller, Roosevelt's African Game Trails, Amer. ed. p. 480; London ed., p. 491. (Summit of Aberdare Range, British East Africa; type in U. S. Nat. Mus.)

*Specimens.*—One hundred and twenty-eight, from localities as follows: British East Africa: Aberdare Mountains, 4 (Heller); Fort Hall, 8 (Loring); Nyeri, 1 in alcohol (Loring); upper Nzoia River, 4 in alcohol (Heller); west side of Mount Kenia, 111, including 20 in alcohol (Loring, Mearns, Heller).

After careful study of this fine series of specimens, I am unable to recognize as distinct the smoky shrew of the Aberdare Mountains. While there is considerable individual variation in color, true *fumosa* is usually recognizable from the grayer *schistacea* and the darker, more blackish, *selina* by color alone. The skulls of typical *fumosa* average smaller than those of the more southern and western subspecies, and are much less in size than the skulls of its more northern ally, *Crocidura raineyi.*

[1] Smithsonian Misc. Coll., vol. 56, No. 15, p. 3. Dec. 23.
[2] Smithsonian Misc. Coll., vol. 56, No. 15, p. 4. Dec. 23.
[3] Ann. and Mag. Nat. Hist., ser. 8, vol. 15, p. 511; and vol. 16, p. 134. May and August, 1915.

*Measurements of Specimens of the Crocidura fumosa group.*

| Species and locality. | No. | Sex. | Head and body. | Tail vertebræ. | Hind foot, dry. | Skull: Condylobasal length. | Maxillary breadth | Breadth of braincase. | Depth of braincase (median). | Mandible. | Upper tooth row (entire). | Condition of teeth. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *C. f. fumosa.* | | | | | | | | | | | | |
| B. E. A.: Mount Kenia | 164074 | Male | 81 | 51 | 15.2 | 20.3 | 6.2 | 9.9 | 5.5 | 10.2 | 9.0 | Much worn. |
| Do | 164075 | do | 81 | 52 | 14.8 | 20.4 | 6.1 | 10.0 | 5.3 | 11.1 | 9.4 | Little worn. |
| Do | 164078 | do | 80 | 50 | 14.5 | 20.0 | 6.0 | 9.7 | 5.3 | 11.0 | 9.0 | Moderately worn. |
| Do | 164079 | do | ..... | ..... | 14.8 | 20.0 | 6.4 | 10.2 | 5.2 | 10.9 | 9.1 | Do. |
| Do | 164083 | do | 81 | 53 | 14.7 | 19.8 | 5.8 | 9.6 | 5.4 | 11.1 | 9.0 | Little worn. |
| Do | 164092 | do | 76 | 41 | 14.3 | 19.8 | 5.9 | 9.8 | 5.3 | 10.9 | 9.3 | Do. |
| Do | 164095 | do | 81 | 49 | 14.2 | 20.1 | 5.9 | 9.3 | 5.4 | 10.9 | 9.3 | Do. |
| Do | 164097 | do | 81 | 55 | 14.0 | 19.3 | 6.0 | 9.6 | 5.3 | 10.8 | 8.9 | Do. |
| Do | 164103 | do | 85 | 58 | 14.4 | 19.8 | 6.0 | 9.7 | 5.7 | 10.3 | 8.6 | Moderately worn. |
| Do | 164105 | do | 79 | 57 | 15.0 | 20.0 | 6.1 | 9.9 | 5.5 | 11.2 | 9.3 | Little worn. |
| Do | 164106 | do | 83 | 60 | 15.2 | 20.5 | 6.4 | 10.0 | 5.7 | 11.2 | 9.0 | Moderately worn. |
| Do | 164113 | do | 78 | 54 | 14.2 | 20.7 | 6.8 | 9.7 | 5.6 | 11.0 | 9.4 | Do. |
| Do | 164119 | do | 80 | 48 | 14.4 | 20.5 | 6.2 | 9.9 | 5.6 | 11.3 | 9.2 | Little worn. |
| Do | 164121 | do | 86 | 52 | 14.7 | 21.0 | 6.3 | 10.1 | 5.6 | 11.2 | 9.1 | Moderately worn. |
| Do | 164123 | do | 78 | 54 | 14.7 | 19.8 | 6.0 | 9.8 | 5.4 | 11.2 | 9.1 | Little worn. |
| Do | 164124 | do | 75 | 50 | 15.1 | 20.6 | 6.0 | 10.2 | 5.5 | 11.5 | 9.4 | Do. |
| Do | 164126 | do | 75 | 55 | 14.7 | 20.0 | 6.2 | 10.2 | 5.6 | 11.2 | 9.3 | Do. |
| Do | 164127 | do | 80 | 55 | 14.0 | 19.7 | 6.1 | 10.0 | 5.7 | 10.9 | 8.5 | Moderately worn. |
| Do | 164128 | do | 85 | 49 | 14.7 | 20.1 | 6.4 | 9.8 | 5.4 | 10.9 | 9.1 | Do. |
| Do | 164132 | do | 81 | 49 | 14.5 | 19.8 | 6.1 | 9.8 | 5.3 | 10.8 | 8.8 | Do. |
| Do | 164135 | do | 82 | 49 | 14.7 | 21.3 | 6.3 | 9.8 | 5.4 | 11.1 | 9.2 | Do. |
| Do | 164138 | do | 77 | ..... | 14.9 | 20.2 | 6.3 | 9.8 | 5.7 | 10.8 | 9.1 | Do. |
| Do | 164048 | Female | 85 | 53 | 15.2 | 20.2 | 6.2 | 10.1 | 5.8 | 11.0 | 8.9 | Do. |
| Do | 164051 | do | 81 | 58 | 14.8 | 20.8 | 6.3 | 10.3 | 5.8 | 11.4 | 8.8 | Much worn. |
| Do | 164052 | do | 77 | 56 | 14.1 | 19.8 | 6.2 | 9.5 | 5.4 | 10.7 | 8.9 | Moderately worn. |

| | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Do | 164057 | ...do.... | 78 | 53 | 13.9 | 19.4 | 5.9 | 9.7 | 5.2 | 10.6 | 8.7 | Little worn. |
| Do | 164058 | ...do.... | 78 | 47 | 14.0 | 19.4 | 6.1 | 9.8 | 5.4 | ..... | 8.9 | Do. |
| Do | 164064 | ...do.... | 76 | 54 | 14.1 | 19.8 | 6.2 | 9.8 | 5.4 | 10.9 | 8.9 | Do. |
| Do | 164065 | ...do.... | 92 | 49 | 14.6 | 20.5 | 6.0 | 9.7 | 5.3 | 11.2 | 9.3 | Moderately worn. |
| Do | 164069 | ...do.... | 81 | 51 | 14.8 | 20.2 | 6.0 | 9.7 | 5.1 | 11.3 | 9.5 | Do. |
| Do | 164072 | ...do.... | 85 | 55 | 14.3 | 20.5 | 6.2 | 10.1 | 5.7 | 11.2 | 9.1 | Do. |
| Do | 164077 | ...do.... | 79 | 57 | 15.1 | 20.2 | 6.2 | 9.9 | 5.6 | 11.1 | 9.4 | Little worn. |
| Do | 164080 | ...do.... | 73 | 57 | 14.3 | 20.2 | 6.0 | 9.8 | 5.4 | 10.9 | 9.4 | Do. |
| Do | 164084 | ...do.... | 75 | 52 | 14.3 | 20.7 | 6.2 | 9.8 | 5.6 | 11.1 | 9.4 | Do. |
| Do | 164086 | ...do.... | 80 | 57 | 14.5 | 20.1 | 6.0 | 10.0 | 5.2 | 11.4 | 8.9 | Moderately worn. |
| Do | 164087 | ...do.... | 81 | 58 | 15.0 | 20.5 | 6.2 | 10.0 | 6.0 | 11.3 | 9.4 | Do. |
| Do | 164100 | ...do.... | 75 | 48 | 14.1 | 20.9 | 5.8 | 9.7 | 5.2 | 10.9 | 8.9 | Do. |
| Do | 164101 | ...do.... | 81 | 52 | 14.2 | 20.6 | 6.0 | 10.1 | 5.5 | 11.2 | 9.2 | Little worn. |
| Do | 164109 | ...do.... | 82 | 56 | 15.5 | 20.5 | 6.2 | 9.7 | 5.6 | 11.1 | 9.4 | Do. |
| Do | 164112 | ...do.... | 82 | 50 | 14.2 | 19.8 | 5.9 | 9.5 | 5.2 | 10.3 | 8.9 | Do. |
| Do | 164136 | ...do.... | 77 | 52 | 13.8 | 19.8 | 5.8 | 9.8 | 5.2 | 10.7 | 9.0 | Do. |
| B. E. A.: Fort Hall | 163946 | Male.... | 82 | 54 | 14.0 | 20.7 | 6.7 | 9.7 | 5.7 | 11.8 | 9.6 | Do. |
| Do | 163947 | ...do.... | 78 | 47 | 13.0 | 20.3 | 6.5 | 9.5 | 5.4 | 11.4 | 9.4 | Do. |
| Do | 163949 | ...do.... | 80 | 42 | 13.9 | 20.4 | 6.4 | 9.2 | 5.3 | ..... | 8.9 | Much worn. |
| Do | 163944 | Female. | 77 | 47 | 13.0 | 20.3 | 6.3 | 9.6 | 5.4 | 11.3 | 9.5 | Little worn. |
| B. E. A.: Aberdare Mountains | [1] 163087 | Male.... | 90 | 55 | 14.5 | 20.1 | 5.9 | 9.6 | 5.6 | 10.5 | 8.9 | Do. |
| Do | 163941 | Female. | 90 | 54 | 14.0 | 19.7 | 6.2 | 9.4 | 5.5 | 11.0 | 8.9 | Unworn. |
| Do | 182441 | ...do.... | 85 | 41 | 15.0 | 20.7 | 6.3 | 10.1 | 5.7 | 11.3 | ..... | Moderately worn. |
| *C. f. schistacea.* | | | | | | | | | | | | |
| B. E. A.: Ulukenia Hills | [2] 16884 | ...do.... | 93 | 52 | 14.7 | 22.0 | 7.3 | 10.1 | 5.7 | 13.0 | 10.2 | Do. |
| Do | 164045 | ...do.... | 86 | 45 | 13.3 | 21.8 | 7.0 | 10.0 | 5.6 | 12.0 | 9.9 | Much worn. |
| Do | 164046 | ...do.... | 81 | 47 | 13.7 | 21.2 | 6.9 | 9.4 | 5.4 | 11.8 | 9.8 | Moderately worn. |
| B. E. A.: Kapiti Plain | 161694 | Male.... | 83 | 53 | 14.0 | 21.6 | 7.0 | 9.8 | 5.7 | 12.0 | 9.8 | Little worn. |
| Do | 161697 | ...do.... | 75 | 46 | 13.7 | 20.6 | 7.0 | 9.5 | 5.4 | 11.7 | 9.5 | Do. |
| *C. f. sclina.* | | | | | | | | | | | | |
| Uganda: Kisimbiri | 164880 | ...do.... | 82 | 54 | 13.7 | 21.2 | 7.0 | ..... | 5.7 | 11.7 | 9.6 | Do. |
| B. E. A.: Kaimosi | 182442 | ...do.... | 80 | 60 | 14.3 | 22.3 | 6.9 | 10.2 | 5.9 | 11.8 | 9.9 | Much worn. |
| Do | 182443 | ...do.... | 85 | 60 | 14.5 | 22.0 | 7.0 | 10.2 | 6.0 | 12.0 | 9.8 | Moderately worn. |

[1] Type of "*Crocidura alchemillæ.*"

[2] Field Mus. Nat. Hist., Chicago; type.

*Measurements of Specimens of the Crocidura fumosa group*—Continued.

| Form and locality. | No. | Sex. | Head and body. | Tail vertebræ. | Hind foot, dry. | Skull: condylobasal length. | Maxillary breadth | Breadth of braincase. | Depth of braincase (median). | Mandible. | Upper tooth row (entire). | Condition of teeth. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *C. f. selina*—Continued. | | | | | | | | | | | | |
| B. E. A.: Kaimosi | 182444 | Male | 85 | 58 | 15.0 | 22.0 | 6.9 | 10.5 | 5.9 | 11.7 | 9.9 | Moderately worn. |
| Do | 182445 | ...do | 85 | 63 | 15.0 | 22.6 | 7.1 | 10.4 | 6.0 | 12.0 | 10.3 | Do. |
| Do | 182478 | ...do | 88 | 64 | 15.0 | 22.3 | 7.0 | 10.6 | 5.8 | 12.1 | 10.0 | Do. |
| Do | 182480 | ...do | 80 | 57 | 14.4 | 22.1 | 6.8 | 10.2 | 5.8 | 12.1 | 9.7 | Do. |
| Do | 182483 | ...do | 85 | 57 | 14.8 | 22.1 | 7.0 | 10.1 | 5.8 | 12.2 | 9.9 | Do. |
| Do | 182488 | ...do | 80 | 58 | 13.9 | 21.3 | 6.8 | 9.9 | 5.5 | 11.8 | 9.9 | Little worn. |
| Do | 182446 | Female | 77 | 60 | 15.0 | 21.9 | 6.9 | 10.4 | 6.0 | 11.8 | 9.9 | Moderately worn. |
| Do | 182485 | ...do | 83 | 63 | 14.8 | 20.5 | 6.1 | 9.4 | 5.7 | 11.0 | 9.0 | Unworn. |
| Do | 182486 | ...do | 80 | 56 | 15.0 | 21.8 | 7.1 | 10.2 | 5.6 | 12.3 | 10.1 | Moderately worn. |
| Do | 182487 | ...do | 80 | 55 | 15.0 | 21.4 | 6.8 | 9.8 | 5.7 | 11.7 | 9.6 | Do. |
| *C. raincyi.* | | | | | | | | | | | | |
| B. E. A.: Mount Gargues | [1] 181817 | Male | 90 | 61 | 15.5 | 24.0 | 7.8 | 10.5 | 5.9 | 13.1 | 11.0 | Do. |
| Do | 182468 | ...do | 90 | 57 | 15.6 | 24.2 | 7.8 | 10.3 | 5.9 | 12.9 | 10.9 | Do. |
| Do | 182548 | ...do | 92 | 64 | 16.0 | 24.2 | 7.9 | 10.7 | 6.2 | 13.4 | 11.0 | Do. |
| Do | 182549 | ...do | 92 | 63 | 16.0 | 24.3 | 8.0 | 10.7 | 6.0 | 13.3 | 11.1 | Do. |
| Do | 182551 | ...do | 90 | 65 | 15.5 | 24.5 | 7.9 | 10.7 | 6.0 | 13.5 | 11.1 | Do. |
| Do | 182552 | ...do | 90 | 60 | 15.5 | 24.0 | 7.9 | 10.6 | 5.9 | 13.6 | 11.2 | Do. |
| Do | 182553 | ...do | 92 | 65 | 16.0 | ..... | 7.9 | ..... | ..... | 13.3 | 11.0 | Little worn. |
| Do | 182554 | ...do | 90 | 64 | 16.0 | 24.0 | 8.1 | 11.1 | 5.9 | 13.5 | 11.0 | Moderately worn. |
| Do | 182550 | Female | 90 | 59 | 15.5 | 23.9 | 7.8 | 11.6 | 5.9 | 13.1 | 10.9 | Do. |

[1] Type.

CROCIDURA FUMOSA SCHISTACEA Osgood.

1910. *Crocidura fumosa schistacea* Osgood, Field Mus., Zool. Ser., vol. 10, No. 3, p. 20. April 7. (Ulukenia Hills=Lukenya Mountains, British East Africa: type in Field Mus. Nat. Hist.)

*Specimens.*—Five, from the following localities:

British East Africa: Kapiti Plains, 3 (Loring); Ulukenia Hills, 2 (Loring).

A female collected by Loring on the Kapiti Plains, May 7, contained six small embryos; one from Ulukenia Hills, November 25, contained five embryos, each about 8 millimeters in length.

The type-specimen of this shrew, which has been lent me by the Field Museum of Natural History, Chicago, is slightly larger than any specimen in our small series. The form is mainly differentiated from *Crocidura fumosa fumosa* by its grayish, less brownish color; but it averages larger, with larger and heavier skull, and there is usually a less conspicuous difference in the size of the second and third unicuspid teeth. I mistrust that this is the species described by Dollman in 1915 as *Crocidura luna umbrosa*,[1] type-locality Machakos. There seems to be no reason to separate the two from the description, and Dollman evidently had no specimens which he referred to *schistacea* when preparing his synopsis of the forms of *Crocidura*.

For measurements of specimens of the subspecies of *C. fumosa* see table, pages 56-58.

CROCIDURA FUMOSA SELINA Dollman.

1915. [*Crocidura*] *f. selina* Dollman, Ann. and Mag. Nat. Hist., ser. 8, vol. 15, p. 510. May. (Mabiri Forest, Chagwe, Uganda; type in British Museum.)

1915. *Crocidura fumosa selina* Dollman, Ann. and Mag. Nat. Hist., ser. 8, vol. 16, p. 371. October.

*Specimens.*—Seventeen, from localities as follows:

Uganda: Kampala, 3 in alcohol (Heller, Loring); Kisimbiri, 1 (Loring).

British East Africa: Kaimosi, 13 (Heller).

Heller records one female with one embryo and one with three at Kaimosi, January 27 and 28.

This subspecies is well differentiated from true *fumosa* and from *schistacea* by its darker, more blackish coloration and larger skull. Although its range extends eastward along the north shore of Victoria Nyanza to Kaimosi, specimens from the upper Nzoia River on the Guas Ngishu Plateau are clearly referable to typical *fumosa*.

[1] Ann. and Mag. Nat. Hist., ser. 8, vol. 15, p. 514, May; vol. 16, p. 360, October, 1915.

#### CROCIDURA RAINEYI Heller.

Plate 8, figs. 9, 10.

1912. *Crocidura raineyi* Heller, Smithsonian Misc. Coll., vol. 60, No. 12, p. 7. November 4. (Mount Gargues, British East Africa; type in U. S. Nat. Mus.)

*Specimens.*—Nine, as follows:

British East Africa: Mount Gargues, Mathews Range (Heller).

Though obviously a member of the *fumosa* group this distinct species is easily separated from all the subspecies of *fumosa* by its large size and large skull. Heller writes:[1]

> The species is confined to the extreme forested summit of Mount Garguez, which is isolated from the Kenia forest by low bush-covered desert in which no representative of the *fumosa* group is known to occur. *Fumosa* and its allies are all forest species known only from the highlands, with the exception of *schistacea* of the high veldt of the Athi Plains. On Mount Garguez this race was found from the lower edge of the forest at 5,000 feet to the summit, 7,000 feet.

#### CROCIDURA JACKSONI Thomas.

1904. *Crocidura jacksoni* Thomas, Ann. and Mag. Nat. Hist., ser. 7, vol. 14, p. 238. September. (Ravine Station, British East Africa; type in British Museum.)

*Specimens.*—Fourteen, from the following localities:

British East Africa: Isiola River, 1 (Heller); Kaimosi, 1 (Turner); Kapiti Plains, 1 (Loring); Mount Sagalla, 3 (Heller); Mtoto Andei, 1 (Heller); Neuman's Boma, Northern Guaso Nyiro, 1 (Heller); Southern Guaso Nyiro, 3 (Loring); Ulukenia Hills, 2 in alcohol (Loring); Voi, 1 (Heller).

A female, collected by Loring in the Southern Guaso Nyiro, June 30, contained three fetuses, and one collected by Heller at Voi, November 20, four. Most of the skins are in the ordinary brown coat, but some, showing the progress of the moult, are partly in the brown and partly in the darker slate-brown pelage. The Kaimosi specimen is very dark, almost blackish, and is marked by a silvery lustre as described in the type by Thomas. This specimen is really so very different from the rest of the series in color that I hesitate to call it the same form. Dollman has described a darker subspecies of *jacksoni* from the Amala River, Nyanza Province, British East Africa, as *Crocidura jacksoni amalæ*,[2] but this specimen does not agree with the description in many ways. It probably represents a color phase of *jacksoni* or perhaps a distinct species, but owing to the lack of authentic material of *jacksoni* for comparison I do not feel justified in separating it.

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[1] Smithsonian Misc. Coll., vol. 60, No. 12, p. 8, Nov. 4, 1912.

[2] Ann. and Mag. Nat. Hist., ser. 8, vol. 15, p. 516, May; vol. 16, p. 376, October, 1915.

*Measurements of specimens of Crocidura jacksoni and C. hildegardeæ.*

| Form and locality. | No. | Sex. | Head and body. | Tail vertebræ. | Hind foot, dry. | Skull: Condylobasal length. | Maxillary breadth | Breadth of braincase. | Depth of braincase (median). | Mandible. | Upper tooth row (entire). | Condition of teeth. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *C. jacksoni.* | | | | | | | | | | | | |
| B. E. A.: | | | | | | | | | | | | |
| Isiola River | 182575 | Male | 76 | 49 | 13.0 | ..... | 6.2 | ..... | ..... | 10.3 | 8.6 | Little worn. |
| Neuman's Boma | 182579 | ...do | 85 | 59 | 14.0 | 20.6 | 6.5 | 9.5 | 5.0 | 10.8 | 8.8 | Do. |
| Kapiti Plains | 161692 | ...do | 79 | 55 | 13.5 | 19.8 | 6.3 | 8.7 | 4.8 | 10.2 | 8.9 | Do. |
| So. Guaso Nyiro | 162045 | ...do | 83 | 52 | 13.5 | 21.5 | 6.9 | 9.6 | 4.9 | 11.8 | 9.4 | Much worn. |
| Do | 162043 | Female | 84 | 50 | 13.0 | 20.5 | 6.8 | 9.7 | 4.8 | 10.9 | 9.3 | Moderately worn. |
| Do | 162044 | ...do | 81 | 54 | 13.5 | ..... | 6.7 | ..... | ..... | 10.8 | 8.8 | Do. |
| Voi | 182508 | ...do | 75 | 53 | 13.0 | 20.3 | 6.3 | 9.0 | 5.0 | 10.9 | 8.8 | Do. |
| Mount Sagalla | 182505 | Male | 85 | 55 | 13.5 | 21.2 | 6.6 | 9.3 | 5.2 | 11.2 | 9.1 | Do. |
| Do | 182507 | ...do | 80 | 55 | 13.0 | 20.1 | 6.4 | 9.2 | 5.1 | 11.0 | 9.0 | Do |
| Do | 182502 | Female | 75 | 52 | 13.0 | ..... | 6.2 | 9.0 | 5.1 | 10.8 | ..... | Do. |
| *C. h. hildegardeæ.* | | | | | | | | | | | | |
| Uganda: Kabula Muliro | [1] 164639 | Male | 82 | 52 | 12.5 | ..... | 6.3 | ..... | ..... | 10.2 | 8.5 | Do. |
| B. E. A.: | | | | | | | | | | | | |
| Naivasha | 161748 | ...do | 77 | 45 | 13.0 | 18.7 | 5.9 | 8.4 | 5.0 | 10.0 | 8.1 | Do. |
| Do | 162047 | ...do | 69 | 47 | 12.5 | ..... | 5.7 | 8.3 | 5.2 | 9.5 | 8.2 | Do. |
| Kapiti Plains | 161691 | Female | 70 | 49 | 12.0 | ..... | 6.1 | 8.4 | 4.6 | 10.0 | 8.6 | Little worn. |
| Oljoro O Nyon | 162042 | Male | 75 | 48 | 13.0 | 18.0 | 5.6 | 8.3 | 4.8 | 9.0 | 7.8 | Do. |
| Engare Narok | 162046 | Female | 68 | 51 | 13.0 | ..... | ..... | 8.4 | 4.8 | 9.3 | ..... | Moderately worn. |
| Fort Hall | 163948 | Male | 84 | 52 | 13.0 | 19.6 | 6.1 | 8.8 | 5.0 | 10.2 | 8.8 | Little worn. |
| Wambugu | 163957 | ...do | 80 | 48 | 12.5 | 19.0 | 6.1 | 8.6 | 4.8 | 9.6 | 8.0 | Moderately worn. |
| Do | 163952 | Female | 79 | 56 | 13.0 | 18.7 | 5.7 | 8.5 | 4.9 | 9.5 | 7.9 | Do. |
| Nyeri | 163953 | Male | 79 | 51 | 13.5 | 18.3 | 5.9 | 8.3 | 4.8 | 9.3 | 7.9 | Little worn. |

[1] Type of *Crocidura maanjæ* Heller.

*Measurements of specimens of Crocidura jacksoni and C. hildegardæ*—Continued.

| Form and locality. | No. | Sex. | Head and body. | Tail vertebræ. | Hind foot, dry. | Skull: Condylobasal length. | Maxillary breadth | Breadth of braincase. | Depth of braincase (median). | Mandible. | Upper tooth row (entire). | Condition of teeth. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *C. h. hildegardæ*—Continued. | | | | | | | | | | | | |
| B. E. A.—Continued. | | | | | | | | | | | | |
| Nyeri | 163954 | Male | 77 | 49 | 13.0 | ..... | 5.7 | 8.3 | 4.8 | 9.5 | 8.0 | Little worn. |
| Do | 163955 | Female | 75 | 47 | 12.5 | 17.5 | 5.4 | ..... | ..... | 9.3 | 7.7 | Do. |
| Isiola River | 182447 | Male | 76 | 44 | 13.0 | 19.2 | 6.0 | 9.2 | 4.7 | 9.8 | 8.2 | Do. |
| Mount Lololokwi | 182513 | ...do | 70 | ..... | 12.0 | 18.5 | 5.9 | 8.6 | 5.0 | 9.7 | 8.3 | Do. |
| Do | 182514 | ...do | 75 | 51 | 13.0 | ..... | 6.1 | ..... | ..... | 10.0 | 8.2 | Moderately worn. |
| Do | 182515 | ...do | 70 | 49 | 12.5 | 19.0 | 5.8 | 8.8 | 4.7 | 9.9 | 8.4 | Little worn. |
| Do | 182518 | ...do | 71 | 54 | 12.0 | 17.9 | 6.2 | 8.5 | 4.8 | 9.7 | 8.1 | Moderately worn. |
| Do | [1] 181820 | Female | 72 | 51 | 12.5 | 19.3 | 6.1 | 8.7 | 4.8 | 10.3 | 8.5 | Do. |
| Do | 182512 | ...do | 75 | 48 | 12.0 | 18.7 | 5.8 | 8.4 | 4.9 | 9.8 | 8.2 | Little worn. |
| Do | 182517 | ...do | 70 | 50 | 12.0 | 18.5 | 6.0 | 8.8 | 4.8 | 9.5 | 8.2 | Moderately worn. |
| Do | 182519 | ...do | 70 | 47 | 12.5 | 18.7 | 6.1 | 8.8 | 4.7 | 10.0 | 8.4 | Little worn. |
| Do | 182522 | ...do | 72 | 52 | 12.5 | 19.6 | 6.1 | 8.6 | 4.8 | 10.2 | 8.6 | Moderately worn. |
| Mount Gargues | 182509 | Male | 78 | 53 | 13.0 | 19.3 | 6.2 | 8.6 | 4.8 | 10.3 | 8.4 | Considerably worn |
| Do | 182511 | ...do | 71 | 55 | 13.0 | 19.1 | 6.1 | 9.0 | 5.1 | 10.0 | 8.6 | Moderately worn. |
| Do | 182510 | Female | 75 | 55 | 12.5 | 19.0 | 6.1 | 8.8 | 5.0 | 10.1 | 8.2 | Do. |
| Mount Mbololo | 182456 | Male | 75 | 53 | 13.0 | 18.7 | 6.2 | 8.5 | 5.0 | 10.1 | 8.3 | Do. |
| Do | 182457 | ...do | 75 | 53 | 13.5 | ..... | 6.0 | ..... | ..... | 10.1 | 8.2 | Do. |
| Do | 182460 | ...do | 75 | 53 | 13.0 | 19.3 | 6.2 | 8.6 | 5.1 | 10.2 | 8.6 | Do. |
| Do | 182523 | ...do | 72 | 59 | 12.5 | 19.3 | 6.4 | 8.8 | 5.2 | 10.4 | 8.7 | Little worn. |
| Do | [2] 181818 | Female | 70 | 52 | 13.0 | 18.6 | 6.1 | 8.8 | 4.8 | 9.9 | 7.9 | Considerably worn. |
| Do | 182459 | ...do | 75 | 53 | 13.0 | 19.2 | 6.0 | 8.7 | 5.2 | 10.4 | 8.5 | Moderately worn. |
| Mount Sagalla | 182506 | Male | 72 | 45 | 12.0 | 18.8 | 5.8 | 8.5 | 4.7 | 9.9 | 8.2 | Much worn. |
| Do | 182503 | Female | 78 | 52 | 13.0 | 19.4 | 6.3 | 8.8 | 5.0 | 10.3 | 8.8 | Moderately worn. |
| Do | 182504 | ...do | 78 | 45 | 12.0 | 19.2 | 6.2 | 8.5 | 4.9 | 10.2 | 8.6 | Little worn. |
| Mount Umeng[illegible] | 182501 | Male | 72 | 52 | 13.0 | 19.1 | 6.1 | 9.0 | 5.2 | 10.2 | 8.3 | Moderately worn. |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Mount Umengo | 182524 | Female.. | 76 | 50 | 13.0 | 19.1 | 6.0 | 8.8 | 4.8 | 10.5 | 8.3 | Moderately worn. |
| Voi | 182499 | Male.... | 70 | 49 | 12.0 | 18.7 | 5.9 | 8.9 | 4.8 | 10.0 | 8.4 | Do. |
| Ndi | 182500 | ...do.... | 70 | 48 | 12.5 | ..... | 5.9 | 8.7 | 4.9 | 10.2 | 8.4 | Unworn. |
| G. E. A.: | | | | | | | | | | | | |
| Mount Kilimanjaro | 19732 | Female.. | | | ..... | 18.8 | 6.0 | 8.3 | 4.9 | 9.9 | 8.3 | Little worn. |
| Do | 19733 | ...do.... | | | 12.5 | 18.9 | 6.2 | 8.8 | 5.0 | 10.5 | 8.7 | Do. |
| *C. h. altæ.* | | | | | | | | | | | | |
| B. E. A.: | | | | | | | | | | | | |
| Mount Gargues | [3] 181819 | Male.... | 74 | 62 | 13.5 | 19.0 | 6.0 | 8.8 | 5.0 | 9.9 | 8.5 | Do. |
| Do | 182426 | ...do.... | 75 | 64 | 13.0 | 19.4 | 6.1 | 9.0 | 4.8 | 10.0 | 8.6 | Moderately worn. |
| Do | 182427 | ...do.... | 72 | 67 | 14.0 | 19.4 | 6.0 | 9.1 | 5.1 | 10.3 | 8.7 | Do. |
| Do | 182430 | ...do.... | 80 | 65 | 14.0 | 19.7 | 6.1 | 8.9 | 5.1 | 10.4 | 8.5 | Do. |
| Do | 182428 | Female.. | 70 | 63 | 13.5 | ..... | 6.0 | ..... | ..... | 10.2 | 8.7 | Do. |
| Do | 182429 | ...do.... | 75 | 56 | 13.0 | 18.3 | 5.9 | 8.7 | 4.9 | 9.5 | 8.2 | Do. |

[1] Type of *Crocidura hildegardeæ procera* Heller.

[2] Type of *Crocidura lutreola* Heller.

[3] Type.

I am unable satisfactorily to separate this species into forms over all the range, as represented by the specimens listed above. There is considerable variation in the color and the skull but all the specimens are distinctly larger than *hildegardeæ*, and there is never any confusion with that species. Dollman placed Osgood's *Crocidura parvipes*, *C. xantippe*, and Heller's *C. lutreola* in the "*jacksoni*" group. The first two species I consider to be small members of the *hindei-fischeri* group, and *lutreola* does not seem to differ sufficiently from *hildegardeæ* to be recognized as a subspecies of that form. The three specimens listed above from Mount Sagalla were referred by Heller[1] to *Crocidura parvipes*, but comparison with the type of that species shows them to be not of the same species, and I do not find any way to distinguish them from *jacksoni*.

Dollman further recognized *Crocidura gracilipes* Peters as a species of the *jacksoni* group and listed under it specimens in the British Museum from Taveta and Rombo, Kilimanjaro. The Taveta specimens in the United States National Museum collection seem indistinguishable from *Crocidura hildegardeæ*, and under that species I have placed some notes on the type-specimen of *gracilipes*, made at Berlin by Mr. Heller.

For measurements see table, page 61.

[1] Smithsonian Misc. Coll., vol. 60, No. 12, p. 9. Nov. 4, 1912.

### CROCIDURA HILDEGARDEÆ HILDEGARDEÆ Thomas.

Plate 8, figs. 11, 12, 13, 14, 15, 16.

1892. *Crocidura* sp. True, Proc. U. S. Nat. Mus., vol. 15, p. 470. (Kilimanjaro.)
1904. *Crocidura hildegardeæ* Thomas, Ann. and Mag. Nat. Hist., ser. 7, vol. 14, p. 240. September. (Fort Hall, British East Africa; type in British Museum.)
1910. *Crocidura maanjæ* Heller, Smithsonian Misc. Coll., vol. 56, No. 15, p. 4. December 23. (Kabula Muliro, Uganda; type in U. S. Nat. Mus.)
1912. *Crocidura lutreola* Heller, Smithsonian Misc. Coll., vol. 60, No. 12, p. 8. November 4. (Mt. Mbololo, Taita Hills, British East Africa; type in U. S. Nat. Mus.)
1912. *Crocidura hildegardeæ procera* Heller, Smithsonian Misc. Coll., vol. 60, No. 12, p. 10. November 4. (Mt. Lololokwi, British East Africa; type in U. S. Nat. Mus.)

*Specimens.*—Fifty-three, from the following localities:

Uganda: Kabula Muliro, 1 (Loring).

British East Africa: Engare Narok River, 1 (Loring); Fort Hall, 1 (Loring); Isiola River, 1 (Heller); Kapiti Plains, 2 (Loring); Mayo River, Laikipia, 1 (Heller); Meru, 2 in alcohol (Heller); Mount Gargues, 3 (Heller); Mount Kenia, 1 in alcohol (Loring); Mount Lololokwi, 12 (Heller); Mount Mbololo, 8 (Heller); Mount Sagalla, 3 (Heller); Mount Umengo, 2 (Heller); Naivasha Station, 2 (Loring); Ndi, 1 (Heller); Nyeri, 4 (Loring); Oljoro O Nyon River, 1 (Heller); Voi, 1 (Heller); Wambugu, 4 (Loring).

German East Africa: Mount Kilimanjaro, 2 (Abbott).

This species appears to range over a much wider territory than has been supposed. I am unable to separate subspecies from Uganda or from the Taita Hills and Mount Kilmanjaro region of extreme southeastern British East Africa. After long study of our excellent series of specimens the forms described as *maanjæ*, *procera*, and *lutreola* all seem indistinguishable from typical *hildegardeæ*. The accompanying table of measurements shows how absolutely wanting is geographical variation in size, and the range of color within a series from a single region frequently covers virtually the entire range of coloration for the species. On the forested summit of Mount Gargues is a well-marked race with decidedly dark coloration and long tail, but the specimens from the lower juniper slopes of the same mountain are best referred to true *hildegardeæ*.

The following records of embryos are from specimens prepared by Heller: Mount Mbololo, November 4, three, November 8, three; Mount Umengo, November 13, four; Mount Sagalla, November 18, two with three each.

None of the earlier names for species of *Crocidura* from the Kilimanjaro region southward appear to apply to this species. The type-specimen of *Crocidura gracilipes* Peters [1] was examined by

[1] Monatsb. Kön. Akad. Wiss. Berlin, 1870, p. 590. July.

Heller in Berlin and the following manuscript notes made by him are of interest:

*Crocidura gracilipes* Peters. Type alcoholic, skull extracted; No. 3905, Kilimanjaro, v. der Decken. Tail without longer hairs as in *Sylvisorex*, but it is a true *Crocidura*, as no 4th upper unicuspid is present, but there is some space between 3rd unicuspid and large premolar; middle unicuspid about same size as last. Tail, 52 mm., foot 12.2; specimen much shrunken by strong alcohol. Color above mummy brown, below silver brown. Skull: Condyloincisive length, 20.5; breadth braincase, 8.5; length upper tooth row, 8.7; manidble, condyloincisive length, 14.9. Not closely related to any British East African form except perhaps to the *maurisca* group.

#### CROCIDURA HILDEGARDEÆ ALTÆ Heller.

Plate 10, figs. 1, 2.

1912. *Crocidura hildegardeæ altæ* Heller, Smithsonian Misc. Coll., vol. 60, No. 12, p. 9. November 4. (North Creek, at 6,000 feet, Mt. Gargues, Mathews Range, British East Africa; type in U. S. Nat. Mus.)

*Specimens.*—Six, from—

British East Africa: Mount Gargues (Heller).

This well-marked race of *hildegardeæ* is apparently confined to the forested summit of Mount Gargues, from 5,000 to 6,000 feet altitude.

Dollman placed *Crocidura planiceps* Heller in this group, as a close relative of *hildegardeæ*. It is a member of the *bicolor* group, related to *C. b. elgonius* Osgood.

For measurements of specimens of the subspecies of *C. hildegardeæ* see table, pages 61–63.

#### CROCIDURA BICOLOR ELGONIUS Osgood.

1910. *Crocidura bicolor elgonius* Osgood, Ann. and Mag. Nat. Hist., ser. 8, vol. 5, p. 369. April. (Kirui, near Mount Elgon, British East Africa; type in British Museum.)

1910. *Crocidura bicolor elgonius* Roosevelt, African Game Trails, Amer. ed., p. 474; London ed., p. 486.

*Specimens.*—Nine, from the following localities:

British East Africa: Kaimosi, 6 (Heller); Kapiti Plains, 1 (Loring); Kisumu, 1 (Heller); Lukosa River, 1 (Heller).

Loring notes of a female, collected on the Kapiti Plains, May 1, that the mammæ were 3–3 inguinal. Heller found three embryos in a female collected at Kaimosi, January 24, and one embryo in one taken at the same place January 29. The specimen from Kapiti Plains does not differ in any characters from the specimens taken near Victoria Nyanza.

*Measurements of shrews of the bicolor-allex group.*

| Form and locality. | No. | Sex. | Head and body. | Tail vertebræ. | Hind foot, dry. | Skull: Condylobasal length. | Maxillary breadth | Breadth of brain-case. | Depth of brain-case (median). | Mandible. | Upper tooth row (entire). | Condition of teeth. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *C. b. elgonius.* | | | | | | | | | | | | |
| B. E. A.: | | | | | | | | | | | | |
| Kisumu | 182439 | Male | 56 | 38 | 10.0 | 16.0 | 4.8 | 7.3 | 4.3 | 8.1 | 6.9 | Unworn. |
| Lukosa River | 182438 | do | 61 | 40 | 10.0 | ..... | 5.1 | ..... | ..... | 8.2 | 7.0 | Do. |
| Kaimosi | 182432 | do | 60 | 35 | 10.0 | 15.8 | 4.7 | 7.3 | 3.9 | 8.2 | 6.9 | Little worn. |
| Do | 182434 | do | 65 | 39 | 9.8 | 15.8 | 5.0 | 7.2 | 4.2 | 8.1 | 6.8 | Moderately worn. |
| Do | 182435 | do | 61 | 39 | 10.4 | 16.5 | 5.1 | 7.5 | 4.2 | 8.1 | 7.2 | Unworn. |
| Do | 182437 | do | 62 | 43 | 10.1 | 15.5 | 4.8 | 7.0 | 3.8 | 8.1 | 6.7 | Do. |
| Do | 182433 | Female | 55 | 40 | 9.5 | 15.0 | 4.6 | ..... | ..... | 7.8 | 6.7 | Little worn. |
| Kapiti Plains | 161693 | do | 64 | 38 | 9.6 | 15.6 | 4.9 | 7.3 | 3.8 | 7.8 | 6.8 | Moderately worn. |
| *C. b. planiceps.* | | | | | | | | | | | | |
| Lado: | | | | | | | | | | | | |
| Rhino Camp | [1] 164641 | Male | 71 | 53 | 12.3 | 17.7 | 5.1 | 7.7 | 4.3 | 8.9 | 7.8 | Little worn. |
| Do | 164862 | do | 73 | 52 | 11.7 | ..... | 5.2 | ..... | ..... | 9.1 | 7.7 | Considerably worn. |
| Do | 164863 | do | 62 | 50 | 11.5 | 17.0 | 5.1 | 7.5 | 4.3 | 8.8 | 7.3 | Moderately worn. |
| Do | 164865 | do | 69 | 49 | 12.0 | 16.5 | 5.0 | 7.5 | 4.2 | 8.5 | 7.4 | Unworn. |
| Do | 164864 | Female | 63 | 51 | 11.0 | 16.4 | 5.0 | 7.4 | 4.2 | 8.4 | 7.3 | Do. |
| Uganda: Hoima | 164901 | Male | 67 | 47 | 10.9 | 16.8 | 5.2 | 7.6 | 4.3 | 8.4 | 7.3 | Moderately worn. |
| *C. allex.* | | | | | | | | | | | | |
| B. E. A.: | | | | | | | | | | | | |
| Naivasha | [2] 16820 | Male | 64 | 45 | 11.0 | 16.7 | 5.1 | 7.7 | 4.6 | 8.5 | 7.2 | Moderately worn. |
| Do | 162049 | do | 65 | 39 | 11.0 | 16.3 | 5.0 | 7.7 | 4.5 | 7.9 | 7.1 | Little worn. |
| Do | 162051 | do | 62 | 43 | 11.3 | 16.7 | 5.0 | 7.4 | 4.4 | 8.5 | 7.3 | Do. |
| Do | 162053 | do | 66 | 43 | 11.2 | 16.0 | 5.2 | 7.7 | 4.7 | 8.2 | 7.0 | Do. |
| Do | 162052 | Female | 64 | 41 | 11.0 | 15.6 | 5.0 | 7.4 | 4.4 | 7.7 | 6.7 | Moderately worn. |
| Oljoro O Nyon | 162041 | do | 65 | 45 | 11.3 | 16.8 | 5.5 | 7.9 | 4.6 | 8.8 | 7.5 | Do. |
| Aberdare Mountains | 182431 | Male | 60 | 41 | 11.0 | 16.1 | 4.8 | 7.7 | 4.7 | 8.0 | 7.0 | Do. |

| | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *C. a. alpina.* | | | | | | | | | | | |
| B. E. A.: | | | | | | | | | | | |
| Mount Kenia | 163966 | Male | 61 | 38 | 11.6 | 15.7 | 5.1 | 7.7 | 4.4 | 8.0 | 7.1 | Little worn. |
| Do | 163971 | ...do | 57 | 37 | 11.0 | 15.2 | 4.8 | 7.4 | 4.4 | 7.6 | 6.8 | Do. |
| Do | 163972 | ...do | 62 | 34 | 11.0 | 15.5 | 4.9 | 7.4 | 4.3 | 7.7 | 7.0 | Moderately worn. |
| Do | 163973 | ...do | 59 | 37 | 11.1 | ..... | 4.8 | 7.4 | 4.3 | 7.5 | 6.8 | Little worn. |
| Do | [1] 163089 | Female | 65 | 39 | 10.6 | 15.7 | 4.8 | 7.5 | 4.2 | 7.9 | 6.9 | Do. |
| Do | 163962 | ...do | 60 | 38 | 11.0 | 15.5 | 4.8 | 7.4 | 4.4 | 7.7 | 6.7 | Do. |
| Do | 163963 | ...do | 66 | 39 | 10.8 | 15.7 | 4.8 | ..... | ..... | 7.8 | 6.9 | Moderately worn. |
| Do | 163964 | ...do | 60 | 37 | 10.4 | 15.4 | 4.8 | 7.5 | 4.3 | 7.6 | 6.8 | Little worn. |
| Do | 163965 | ...do | 60 | 36 | 10.3 | 15.0 | 4.7 | 7.4 | 4.3 | 7.8 | 6.7 | Do. |
| Do | 163968 | ...do | 63 | 36 | 11.0 | 15.9 | 4.9 | 7.7 | 4.3 | ..... | 7.1 | Do. |

[1] Type.

[2] Field Mus. Nat. Hist.; type.

### CROCIDURA BICOLOR PLANICEPS Heller.

Plate 10, figs. 3, 4.

1910. *Crocidura planiceps* Heller, Smithsonian Misc. Coll., vol. 56, No. 15, p. 5. December 23. (Rhino Camp, Lado Enclave; type in U. S. Nat. Mus.)

*Specimens.*—Seven, from the following localities:

Lado: Rhino Camp, 6, including one in alcohol (Loring).

Uganda: Hoima, 1 (Loring).

This shrew shows close relationship with *C. b. elgonius,* and is chiefly distinguished by its slightly larger size and longer tail. The specimen from Hoima, Uganda, appears somewhat intermediate, though plainly belonging best with *planiceps.* There is a remarkable variation in the relative size of the second and third upper unicuspids in this form.

For measurements see page 66.

### CROCIDURA ALLEX ALLEX Osgood.

1910. *Crocidura allex* Osgood, Field Mus., Zool. Ser., vol. 10, No. 3, p. 20. April 7. (Naivasha, British East Africa; type in Field Mus. Nat. Hist.)

1910. *Crocidura allex* Roosevelt, African Game Trails, Amer. ed., p. 480; London ed., p. 491.

*Specimens.*—Twelve, from the following localities:

British East Africa: Aberdare Range, 2 (Heller); Naivasha Station, 9, including 3 in alcohol (Loring); Oljoro O Nyon River, 1 (Heller).

The specimens from the summit of the Aberdare Range are decidedly intermediate in characters between *allex* and *alpina,* but on the whole go best with the Naivasha specimens of *allex.*

CROCIDURA ALLEX ALPINA Heller.

Plate 10, figs. 5, 6.

1910. *Crocidura alpina* Heller, Smithsonian Misc. Coll., vol. 56, No. 9, p. 5. July 22. (West slope of Mt. Kenia at 10,000 feet, British East Africa; type in U. S. Nat. Mus.)

*Specimens.*—Twenty-two, including seven in alcohol, from—
British East Africa: Mt. Kenia (Loring, Mearns).

This brown pygmy shrew is related to the Naivasha *allex* and the two forms are externally very much alike. The Kenia form has a slightly smaller skull and noticeably smaller first upper unicuspid tooth. Mearns found four fetuses in a female collected September 29 at 10,000 feet altitude. Heller states: [1]

The range of this species extends from 10,000 to 13,000 feet—that is, from the upper limit of the bamboo forest to the lower part of the giant *Senecio* zone. Through most of this extent it is associated with the giant Crocidura, *C. nyansæ*, attaining, however, a somewhat higher altitude than this species.

Through an unfortunate accident in the photograph studio, the type skull of *Crocidura alpina* was badly damaged after the pictures shown on Plate 10 were made.

For measurements see page 67.

CROCIDURA ROOSEVELTI (Heller).

Plate 9.

1910. *Heliosorex roosevelti* Heller, Smithsonian Misc. Coll., vol. 56, No. 15, p. 6. December 23. (Rhino Camp, Lado Enclave; type in U. S. Nat. Mus.)

*Specimen.*—One, from—
Lado: Rhino Camp (Loring).

Externally this unique type-specimen resembles greatly certain specimens of *Crocidura hildegardeæ*, but its long tail and peculiar skull and teeth readily distinguish it. The small size of the claws and the elongated occiput are so closely approached in other species that they become purely relative characters and can hardly be considered generic. An even better specific character is found in the last upper unicuspid. This tooth in *C. roosevelti* differs from all African species of *Crocidura* which I have seen in the relatively large size of the cone and small cingulum shelves, especially the exterior. The difference is almost exactly that between two common European species, *C. russula* and *C. leucodon*, though somewhat more pronounced in the African species.

CROCIDURA MAURISCA Thomas.

1904. *Crocidura maurisca* Thomas, Ann. and Mag. Nat. Hist., ser. 7, vol. 14, p. 239. September. (Entebbe, Uganda; type in British Museum.)

*Specimens.*—Twenty-three, including 12 in alcohol, from—
British East Africa: Kaimosi (Heller).

[1] Smithsonian Misc. Coll., vol. 56, No. 9, p. 5. July 22, 1910.

*Measurements of specimens of Crocidura maurisca and C. littoralis.*

| Species and locality. | No. | Sex. | Head and body. | Tail vertebræ. | Hind foot, dry. | Skull: Condylobasal length. | Maxillary breadth. | Breadth of braincase. | Depth of braincase (median). | Mandible. | Upper tooth row (entire). | Condition of teeth. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *C. maurisca.* | | | | | | | | | | | | |
| **B.** E. A.: Kaimosi | 182535 | Male | 92 | 63 | 16.0 | 21.2 | 6.5 | ..... | 5.8 | 11.4 | 9.4 | Little worn. |
| Do | 182545 | ...do | 95 | 73 | 16.5 | 22.2 | 6.4 | 9.8 | 5.4 | 11.7 | 9.9 | Unworn. |
| Do | 182546 | ...do | 94 | 66 | 16.5 | 21.5 | 6.6 | 9.7 | 5.5 | 11.2 | 9.7 | Do. |
| Do | 182547 | ...do | 85 | 64 | 15.5 | 21.3 | 6.4 | 9.3 | 5.4 | 11.3 | 9.4 | Little worn. |
| Do | 182532 | Female | 90 | 55 | 14.5 | 20.7 | 6.4 | 9.6 | 5.4 | 11.2 | 9.1 | Do. |
| Do | 182536 | ...do | 82 | 66 | 15.5 | 21.0 | 6.3 | 9.3 | 5.4 | 11.1 | 9.3 | Moderately worn. |
| Do | 182542 | ...do | 85 | 60 | 15.5 | 20.1 | 6.2 | 9.3 | ..... | 10.9 | 9.2 | Do. |
| *C. littoralis.* | | | | | | | | | | | | |
| Uganda: Butiaba | [1]164642 | Male | 96 | 67 | 16.5 | 22.6 | 6.4 | 9.9 | 5.9 | 11.9 | 10.0 | Do. |

[1] Type.

CROCIDURA LITTORALIS Heller.

Plate 10, figs. 7, 8.

1910. *Crocidura littoralis* HELLER, Smithsonian Misc. Coll., vol. 56, No. 15, p. 5. December 23. (Butiaba, Uganda; type in U. S. Nat. Mus.)

*Specimen.*—One, the type:

UGANDA: Butiaba (Loring).

The single specimen of this form examined indicates a shrew very closely related to *Crocidura maurisca*. The few trifling differences between the two make it seem probable that they intergrade. Larger series may even prove the two indistinguishable. No specimen in our small series of *maurisca*, however, is quite so large or so richly colored as is the type of *littoralis*.

For measurements see table, page 69.

# Order CHIROPTERA.

## Family PTEROPIDÆ.

### Genus ROUSETTUS Gray.

1821. *Rousettus* GRAY, London Med. Rep., vol. 15, p. 299. April 1. (*R. ægyptiacus.*)

1912. *Lissonycteris* ANDERSEN, Cat. Chir. Brit. Mus., ed. 2, vol. 1, p. 23. March 23. [Subgenus.] (*R. angolensis.*)

Several species of this genus have recently been added to the list of East African fruit bats, but only one form is represented in our collections.

ROUSETTUS ANGOLENSIS (Bocage).

1898. *Cynonycteris angolensis* BOCAGE, Journ. Sci., Math., Phys. Nat., Acad. Sci. Lisboa, ser. 2, vol. 5, p. 133. (Pungo Andongo, Angola; cotypes in Museu Bocage, Lisbon, and British Museum.)

1910. *Rousettus angolensis* THOMAS AND WROUGHTON, Trans. Zool. Soc. London, vol. 19, p. 487. March.

*Specimen.*—One, from—

UGANDA: Mobuku Valley, East Ruwenzori (Dent).

"Very plentiful in the lower valleys of Ruwenzori, but not seen above 6,500 feet. Native name Bihukusi."[1]

### Genus EIDOLON Rafinesque.

1815. *Eidolon* RAFINESQUE, Anal. Nat., p. 54. (*E. helvum.*)

1861. *Pterocyon* PETERS, Mon.-ber. K. Preuss. Akad. Wiss. Berlin, p. 423. (*E. helvum.*)

This genus of fruit bats is widely spread over middle Africa, but no specimens were collected by members of the Smithsonian expeditions.

[1] Woosnam, Trans. Zool. Soc. London, vol. 19, p. 487, March, 1910.

EIDOLON HELVUM (Kerr).

1792. *Vesp[ertilio] vampyrus helvus* Kerr, Anim. Kingd., p. 91. (Senegal.)
1907. *Pterocyon helvus* Andersen, Ann. and Mag. Nat. Hist., ser. 7, vol. 19, p. 504. June. (Fixes type locality; type-specimen said to have been "originally in Museum Leverianum; has probably been lost.")

*Specimen.*—One in alcohol, from—
Zanzibar: Zanzibar (Weddell).

Genus EPOMOPHORUS Bennett.

1836. *Epomophorus* Bennett, Proc. Zool. Soc. London, 1835, p. 149. February 12. (*E. gambianus.*)

Three species, of the five known from the limits of this list, are included in the collection. The two desiderata are *Epomophorus gambianus* and *E. labiatus*, both of which have been recorded from Abyssinia.

EPOMOPHORUS WAHLBERGI HALDEMANI (Hallowell).

1846. *Pteropus haldemani* Hallowell, Proc. Acad. Nat. Sci. Philadelphia, vol. 3, p. 52. (West Africa; type in Acad. Nat. Sci. Philadelphia.)

*Specimens.*—Two, from the following localities:
British East Africa: Taita Hills, 1 (Heller).
Zanzibar: Zanzibar, 1 in alcohol (Weddell).

EPOMOPHORUS MINOR Dobson.

1880. *Epomophorus minor* Dobson, Proc. Zool. Soc. London, 1879, p. 715. April. (Zanzibar; type in British Museum.)

*Specimen.*—One in alcohol, from—
Zanzibar: Zanzibar (received from Dr. G. E. Dobson).

EPOMOPHORUS ANURUS Heuglin.

1864. *Epomophorus anurus* Heuglin, Nov. Act. Acad. Caes. Leop., vol. 31, part 7 p. 12. (Bongo, Bahr-el-Ghazal, Sudan; cotypes in R. Nat. Hist. Museum, Stuttgart.)

*Specimens.*—Seventeen, including 8 in alcohol, from—
Uganda: Kampala (Loring, Mearns).
Doctor Mearns's notes show that these specimens were found clinging to the straw roof of the museum building at Kampala.

## Family RHINOPOMIDÆ.

Genus RHINOPOMA Geoffroy.

1813. *Rhinopoma* Geoffroy, Descr. l'Égypte, vol. 2, p. 113. (*R. microphyllum.*)
1816. *Rhinopoma* Oken, Lehrb. Nat., 3ter Theil, 2te Abth., p. 926. (*R. microphyllum.*)

In this instance, and throughout this list in other cases where there is occasion to cite Geoffroy in volume two of "Description del'Égypte," I have followed Palmer [1] in dating that work from 1813. Sherborn,[2] Lyon,[3] and others have brought forward considerable evidence to

[1] North Amer. Fauna, No. 23, p. 17. January 23, 1904.
[2] Proc. Zool. Soc. London, 1897, pp. 287-288. 1897.
[3] Proc. Biol. Soc. Washington, vol. 27, pp. 217-218. Oct. 31, 1914.

prove that Geoffroy's work was not actually published until 1818, but this evidence can hardly be accepted as conclusive. When specific names of long standing, based on type-specimens from known localities, as well as several generic names, are affected by the change of reference, it seems best to require absolute proof to discredit the date of publication of a work like the "Description de l'Égypte." If such proof is ever discovered, *Rhinopoma* and other generic and specific names will date from Oken, 1816, as cited above.

#### RHINOPOMA CYSTOPS Thomas.

1903. *Rhinopoma cystops* Thomas, Ann. and Mag. Nat. Hist., ser. 7, vol. 11, p. 496. May. (Luxor, Lower Egypt; type in British Museum.)

*Specimen.*—One in alcohol from—
Sudan: Shendi (Rothschild).

## Family EMBALLONURIDÆ.

### Genus COLEURA Peters.

1867. *Coleura* Peters, Mon.-ber. K. Preuss. Akad. Wiss. Berlin, p. 479. (*C. afra.*)

Only one of the two known continental species of this genus of bats is included in our East African collections. The unrepresented species, *C. gallarum* Thomas, is of doubtful validity, probably at the most only a northern race of *Coleura afra*. The old record of a Seychelle Island species at Zanzibar has been questioned by Thomas.[1]

#### COLEURA AFRA (Peters).

1852. *Emballonura afra* Peters, Reise Mossambique, Säug., p. 51. (Mozambique; type in Berlin Museum.)

*Specimen.*—One from—
British East Africa: Voi (Heller).

Some measurements from this specimen are: Head and body, 65; tail, 17; foot, 11; ear, 17; forearm, 48. Skull: Condylobasal length, without premaxillary bones, 15.8; greatest length, 17.4; zygomatic breadth, 10.4; upper tooth row, entire, 7. The specimen is an old female, with the teeth considerably worn.

### Genus TAPHOZOUS Geoffroy.

1813. *Taphozous* Geoffroy, Desc. l'Égypte, vol. 2, p. 113. (*T. perforatus.*)
1816. *Taphozous* Oken, Lehrb. Nat., 3ter Theil, 2te Abth., p. 926. (*T. aegyptiacus*=*T. perforatus.*)

Bats of this genus seem to be rare or difficult to obtain in East Africa, as only a single specimen was collected on each of the larger expeditions.

[1] Ann. and Mag. Nat. Hist., ser. 8, vol. 15, p. 578. June, 1915.

#### TAPHOZOUS MAURITIANUS Geoffroy.

1813. *Taphozous mauritianus* Geoffroy, Descr. l'Égypte, vol. 2, p. 127. (Mauritius.)

1816. *T[aphozous] mauritianus* Oken, Lehrb. Nat., 3ter Theil, 2te Abth., p. 927.

*Specimens.*—Two, as follows:

Lado: Rhino Camp, 1 in alcohol (Mearns).

British East Africa: Kisumu, 1 (Heller).

#### TAPHOZOUS PERFORATUS Geoffroy.

1813. *Taphozous perforatus* Geoffroy, Descr. l'Égypte, vol. 2, p. 126. (Ombos and Thebes, Egypt; type in Paris Museum.)

1816. *T[aphozous] aegyptiacus* Oken, Lehrb. Nat., 3ter Theil, 2te Abth., p. 927. (New name for *T. perforatus*.)

*Specimen.*—One in alcohol from—

Sudan: Shendi (Rothschild).

## Family PETALIIDÆ.

### Genus PETALIA Gray.

1838. *Petalia* Gray, Mag. Zool. and Bot., vol. 2, p. 494. (*P. javanica*.)

About 10 species and subspecies of wrinkle-nosed bats are known to occur in equatorial East Africa. Six forms are represented in our collection. No specimens of any member of the widely spread *Petalia thebaica* group were collected by either the Smithsonian or Rainey expeditions.

For measurements of specimens see table, pages 75–76.

#### PETALIA ARGE (Thomas).

1903. *Nycteris arge* Thomas, Ann. and Mag. Nat. Hist., ser. 7, vol. 12, p. 633. December. (Efulen, Cameroons; type in British Museum.)

*Specimen.*—One from—

British East Africa: Yala River (Turner).

This species, new to the fauna of British East Africa, has not previously been recorded from any locality east of the Semliki River. The specimen collected by Mr. Turner east of Victoria Nyanza, on the Yala (Lukosa) River, is therefore of special interest.

#### PETALIA NANA Andersen.

1912. *Petalia nana* Andersen, Ann. and Mag. Nat. Hist., ser. 8, vol. 10, p. 547. November. (Benito River, French Congo; type in British Museum.)

*Specimens.*—Two, as follows:

British East Africa: Yala River (Turner).

These specimens record the extension of the known range of a second member of the "*javanica* group" [1] to British East Africa.

They agree in all details with the description of the type-specimen from west Africa.

[1] Andersen, Ann. and Mag. Nat. Hist., ser. 8, vol. 10, p. 549. November.

PETALIA HISPIDA (Schreber).

1774. *Vespertilio hispidus* SCHREBER, Säugth., pl. 56. (Senegal.)

*Specimens.*—Thirteen, from the following localities:

SUDAN: Bor, 8, including 6 in alcohol (Heller).

BRITISH EAST AFRICA: Nairobi, 1 (Mearns); Tana River, 4, including 3 in alcohol and 1 skeleton (Chanler).

PETALIA AURITA Andersen.

1893. *Nycteris hispida* TRUE, Proc. U. S. Nat. Mus., vol. 16, p. 602. (Not of Schreber.)

1912. *Petalia aurita* ANDERSEN, Ann. and Mag. Nat. Hist., ser. 8, vol. 10, p. 547. (Kilifi, British East Africa; type in British Museum.)

*Specimens.*—Two in alcohol, as follows:

BRITISH EAST AFRICA: Marsabit Road, 1 (Heller); Tana River, 1 (Chanler).

PETALIA ÆTHIOPICA ÆTHIOPICA (Dobson).

1878. *Nycteris æthiopica* DOBSON, Cat. Chir. Brit. Mus., p. 165. (Kordofan, Sudan; type in British Museum.)

*Specimens.*—Two (one in alcohol) from:

UGANDA: Gondokoro (Loring).

PETALIA ÆTHIOPICA LUTEOLA (Thomas).

1901. *Nycteris æthiopica luteola* THOMAS, Ann. and Mag. Nat. Hist., ser. 7, vol. 8, p. 30. July. (Kitui, British East Africa; type in British Museum.)

*Specimens.*—Three, from—

BRITISH EAST AFRICA: Mazeras (Heller).

These specimens are all adult females, taken on December 27. Two were pregnant with one large embryo each.

For measurements of specimens of the subspecies of *Petalia æthiopica* see table, page 76.

True[1] lists four alcoholic specimens of "*Nycteris thebaica*" collected by Dr. W. L. Abbott on Kilimanjaro. These specimens can not now be found, but are doubtless mislaid in the collection.

There is an unfortunate and wholly avoidable confusion regarding the generic name for the group of bats here called *Petalia*. Although Mr. Gerrit S. Miller long ago called attention to the fact that *Nycteris* Geoffroy and Cuvier, 1803, is preoccupied by *Nycteris* Borkhausen, 1797, and is properly used only for a genus of American Vespertilionidæ,[2] some authors insist upon retaining it, contrary to the provisions of the International Code, for the old-world group. Such disregard for established rules is even encouraged by a member of the International Commission, who in a recent paper uses *Nycteris* in place of *Petalia*.[3]

[1] Proc. U. S. Nat. Mus., vol. 15, p. 469, 1892.

[2] Proc. Biol. Soc. Washington, vol. 22, p. 90. April 17, 1909.

[3] J. A. Allen, Bull. Amer. Mus. Nat. Hist., vol. 37, pp. 425–427. September 29, 1917.

*Measurements of Specimens of Petalia.*

| Form and locality. | No. | Sex. | Head and body. | Tail vertebræ. | Ear from inner margin. | Forearm. | Skull: Condylo-basal length. | Zygo-matic breadth. | Postor-bital breadth. | Mandible. | Upper tooth row, in-cluding canine. | Observations. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *P. arge.* | | | | | | | | | | | | |
| B. E. A.: Yala River | 197956 | Female.. | 53 | 65 | 24.7 | 44.3 | 17.6 | 11.0 | 5.4 | 12.9 | 6.7 | Teeth moderately worn. |
| *P. nana.* | | | | | | | | | | | | |
| B. E. A.: | | | | | | | | | | | | |
| Yala River | 197957 | ...do.... | 42 | 42 | 16.2 | 36.0 | 13.9 | 9.5 | 4.4 | 10.7 | 5.4 | Do. |
| Do | 197958 | Male.... | 42 | 44 | 17.7 | 35.1 | 13.8 | 9.3 | 4.0 | 10.2 | 5.3 | Do. |
| *P. hispida.* | | | | | | | | | | | | |
| Sudan: | | | | | | | | | | | | |
| Bor | 164967 | ...do.... | 51 | 46 | 17.3 | 39.7 | 14.5 | 10.5 | 5.3 | 11.0 | 5.5 | Teeth much worn. |
| Do | 164968 | Female.. | 58 | 49 | 17.7 | 41.7 | ..... | 10.3 | 4.8 | 11.0 | 5.6 | Teeth little worn. |
| Do | 166511 | Male.... | 46 | 45 | 19.0 | 38.1 | 13.8 | 9.7 | 4.8 | 10.2 | 5.4 | Teeth moderately worn. |
| Do | 166512 | ...do.... | 41 | 48 | 16.2 | 38.3 | 14.2 | 10.0 | 4.8 | 10.6 | 5.4 | Do. |
| Do | 166514 | ...do.... | 46 | 44 | 17.5 | 39.5 | 14.5 | 10.0 | 5.2 | 10.7 | 5.6 | Do. |
| Do | 166510 | Female.. | 48 | 46 | 18.5 | 41.8 | ..... | 10.2 | 4.8 | 11.4 | 5.8 | Do. |
| Do | 166513 | ...do.... | 49 | 49 | 17.5 | 41.8 | 14.9 | 9.8 | 4.5 | 11.0 | 5.6 | Do. |
| Do | 166515 | ...do.... | 45 | 45 | 16.8 | 41.0 | 14.4 | 9.8 | 4.9 | 10.6 | 5.6 | Do. |
| B. E. A.: | | | | | | | | | | | | |
| Nairobi | 166517 | Male.... | 49 | 40 | 18.0 | 39.8 | 14.5 | 10.2 | 4.6 | 10.6 | 5.7 | Do. |
| Tana River | 21020 | ...do.... | 44 | 49 | 19.1 | 40.2 | 14.2 | 10.3 | 4.7 | 10.9 | 5.6 | Teeth little worn. |
| Do | 21021 | ...do.... | 42 | 46 | 19.5 | 38.0 | 13.9 | 9.8 | 5.0 | 10.4 | 5.7 | Do. |
| Do | 21019 | Female.. | 45 | 52 | 19.5 | 40.8 | 14.5 | 10.3 | 4.7 | 10.6 | 5.8 | Do. |
| *P. aurita.* | | | | | | | | | | | | |
| B. E. A.: | | | | | | | | | | | | |
| Marsabit Road | 184320 | Male.... | 44 | 47 | 21.0 | 40.0 | 15.4 | 10.3 | 5.2 | 11.5 | 6.0 | Teeth moderately worn. |
| Tana River | 21023 | Female.. | 47 | 52 | 22.0 | 40.8 | 15.8 | 10.2 | 5.2 | 11.6 | 6.3 | Teeth little worn. |

*Measurements of specimens of Petalia*—Continued.

| Form and locality. | No. | Sex. | Head and body. | Tail vertebræ. | Ear from inner margin. | Forearm. | Skull: Condylo-basal length. | Zygomatic breadth. | Postorbital breadth. | Mandible. | Upper tooth row, including canine. | Observations. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *P. r. æthiopica.* | | | | | | | | | | | | |
| Uganda: | | | | | | | | | | | | |
| Gondokoro | 166516 | Male | 61 | 58 | 26.5 | 48.0 | ..... | ..... | ..... | ..... | ..... | Alcoholic. |
| Do | 164969 | ..do | ..... | ..... | 22.6 | ..... | 17.8 | 11.8 | 5.4 | 13.2 | 7.1 | Teeth moderately worn. |
| *P. r. luteola.* | | | | | | | | | | | | |
| B. E. A.: | | | | | | | | | | | | |
| Mazeras | 182656 | Female | 60 | 50 | 24.8 | 50.5 | 17.8 | 11.9 | 5.7 | 13.6 | 7.1 | Do. |
| Do | 182657 | ..do | 65 | 54 | 26.6 | 50.2 | 18.3 | 12.7 | 6.0 | 14.4 | 7.5 | Teeth unworn. |
| Do | 182658 | ..do | 63 | 53 | 24.7 | 48.8 | 18.0 | 12.0 | 5.4 | 13.9 | 7.4 | Do. |

## Family MEGADERMIDÆ.

### Genus LAVIA Gray.

1838. *Lavia* Gray, Mag. Zool. and Bot., vol. 2, p. 490. (*L. frons.*)

The yellow-winged bat is well represented in the collection by numerous specimens from many localities. Two subspecies are included in the series, a small northern and a large southern race. Andersen and Wroughton,[1] recognizing these two subspecies, have placed the name *Lavia rex*, previously bestowed by Miller on the large East African race, in the synonymy of the West African *L. frons*, and have described as new the small race from the upper Nile. At the same time they admit that both a small and a large form inhabit West Africa. Until better series of specimens, somewhat comparable to the excellent suite now available from East Africa, are brought together from West and Central Africa, this arbitrary action by Andersen and Wroughton seems entirely unjustified. I have here recognized the two East African forms as distinct from the West African races. They occupy definite areas without overlapping, whereas the West African forms would appear to range together. If either or both the East African races prove to be identical with West African forms, it would seem reasonable to assume that Miller, as "first reviser," had restricted the original

[1] Ann. and Mag. Nat. Hist., ser. 7, vol. 19, pp. 138–140. February, 1907.

name *frons* to the small West African race. In that case *Lavia frons affinis* might become synonymous with *Lavia frons frons*.

LAVIA FRONS REX Miller.

Plate 10, figs. 9, 10.

1892. *Megaderma frons* True, Proc. U. S. Nat. Mus., vol. 15, p. 469. Oct. 26. (Taveta. Not of Geoffroy.)

1905. *Lavia rex* Miller, Proc. Biol. Soc. Washington, vol. 18, p. 227. Dec. 9. (Taveta, British East Africa; type in U. S. Nat. Mus.)

1907. *Lavia frons frons* Andersen and Wroughton, Ann. and Mag. Nat. Hist., ser. 7, vol. 19, p. 138. February. (Part; not of Geoffroy.)

1910. *Lavia frons* Roosevelt, African Game Trails, Amer. ed., pp. 474, 480, and 487 (part); London ed., pp. 486, 492, and 498 (part). (Not of Geoffroy.)

*Specimens.*—Thirty-seven, from the following localities:

British East Africa: Athi Station, 1 in alcohol (Loring); Kisumu, 6 (Heller); Machakos Road, 1 (Medlicott); Southern Guaso Nyiro, 21, including 9 in alcohol (Loring, Mearns, Heller); Taveta, 2, including 1, the type, in alcohol (Abbott); Telek River, Sotik, 3 (Heller); Ulukenia Hills, 3 in alcohol (Loring).

This subspecies differs from *Lavia frons affinis* of the upper Nile and Abyssinia in its generally more robust size. The forearm and ear average longer and the skull is conspicuously larger. Specimens from the vicinity of Victoria Nyanza and north to Lado are clearly intermediate between the two subspecies, but the small size of skull makes them go best with *affinis*. The length of the forearm seems to be the least reliable character to distinguish the races, and the size of skull and teeth the most satisfactory.

Heller and Loring, in the Appendix to Roosevelt's African Game Trails, have the following notes on the yellow-winged bat:

Almost diurnal, flies well by day; hangs from the thorn-tree branches in the sunlight, and flies as soon as it sees a man approaching. One young, which remains attached to the mother until it is more than half her size. (Heller.)

These large semidiurnal bats lived in the thorn-tree groves and thick bush along the Athi, South Guaso Nyero, and Nile Rivers, where we found them more or less common, and at the latter place abundant. At the first two named places they were almost always found in pairs hanging from the thorn trees by their feet, their wings folded before their faces. When disturbed they fly a short distance and alight, but when we returned to the spot a few minutes later they would often be found in the same tree from which they had been started. On the Nile,at Rhino Camp, and in suitable places all along the trail between Kampala and Butiaba, it was not unusual to find three and four in a single thorn tree. On dark days, and once in the bright sunlight, I saw these bats flying about and feeding. At evening they always appeared an hour or so before the sun went down. Their method of feeding was quite similar to that of our fly-catching birds. They would dart from the branches of a thorn tree, catch an insect, then return and hang head downward in the tree while they ate the morsel. One was captured with a young one clinging to it head downward, its feet clasped about its mother's neck. (Loring.)

*Measurements of specimens of Lavia from East Africa.*

| Form and locality. | No. | Sex. | Head and body. | Ear from notch, dry. | Forearm. | Skull: Greatest length, including incisors. | Condylo-basal length. | Zygo-matic breadth. | Entire upper tooth row. | Condition of teeth. |
|---|---|---|---|---|---|---|---|---|---|---|
| *L. f. rex.* | | | | | | | | | | |
| B. E. A.: | | | | | | | | | | |
| Taveta | 18992 | | | 40.3 | | | | | | |
| Do | 182993 | Male | | | 60.8 | | | | 9.7 | Moderately worn. |
| Machakos Road | 162089 | ...do | | 41.0 | 57.0 | | | | | |
| Telek River | 181480 | ...do | 75 | 42.3 | 59.6 | 24.7 | | | 9.1 | Little worn. |
| Do | 181481 | Female | 75 | 41.4 | 59.0 | 25.2 | 21.8 | 15.2 | 9.3 | Considerably worn. |
| So. Guaso Nyiro | 162077 | Male | 75 | 40.3 | 59.6 | 24.9 | | 15.0 | 9.3 | Moderately worn. |
| Do | 162079 | ...do | 81 | 40.8 | 63.3 | 25.7 | 22.6 | 14.8 | 9.5 | Little worn. |
| Do | 162081 | ...do | 77 | 39.4 | 60.0 | | 21.5 | 14.5 | 9.2 | Moderately worn. |
| Do | 162082 | ...do | 72 | 39.2 | 57.0 | 24.7 | 21.7 | | 8.8 | Do. |
| Do | 162084 | ...do | 76 | 40.8 | 58.6 | 24.8 | 21.3 | 14.7 | 9.0 | Do. |
| Do | 162078 | Female | 83 | 43.9 | 64.3 | 26.5 | 22.7 | 15.4 | 9.5 | Do. |
| Do | 162080 | ...do | 80 | 40.3 | 62.5 | 26.0 | 22.3 | 15.5 | 9.3 | Do. |
| Do | 162083 | ...do | 81 | 41.4 | 63.2 | 26.4 | 22.7 | 15.9 | 9.8 | Do. |
| Do | 162085 | ...do | 82 | 41.4 | 60.0 | 25.8 | 22.4 | | 9.4 | Do. |
| Do | 162086 | ...do | 76 | 39.0 | 61.6 | 25.5 | 22.0 | | 9.3 | Unworn. |
| Do | 162087 | ...do | | 41.2 | | | | | | |
| Do | 162088 | ...do | | 40.5 | 63.3 | | 22.6 | 15.3 | 9.4 | Considerably worn. |
| Kisumu | 182659 | Male | 70 | 41.2 | 58.3 | 24.5 | 20.9 | 13.8 | 9.2 | Little worn. |
| Do | 182661 | ...do | 70 | 40.8 | 59.4 | 24.2 | 21.3 | 14.3 | 8.9 | Do. |
| Do | 182660 | Female | 72 | 40.6 | 61.4 | 25.3 | 21.8 | 14.8 | 9.0 | Do. |
| Do | 182662 | ...do | 70 | 40.8 | 58.0 | 24.1 | 20.6 | 14.2 | 8.5 | Do. |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| *L. f. affinis.* | | | | | | | | | | |
| Lado: | | | | | | | | | | |
| Rhino Camp | 164915 | Male | | 38.7 | | 24.6 | 21.3 | 14.6 | 8.8 | Considerably worn. |
| Do | 164916 | ...do | 68 | 37.3 | | 23.8 | 20.3 | 14.1 | 8.4 | Much worn. |
| Do | 164917 | ...do | 65 | 37.8 | | 22.7 | 19.4 | 12.5 | 8.3 | Unworn. |
| Do | 164918 | ...do | 71 | 37.2 | | 22.9 | 19.6 | 13.3 | 8.5 | Moderately worn. |
| Do | 164924 | ...do | | 36.2 | | | | | 8.4 | Much worn. |
| Do | 164925 | ...do | | 38.3 | | 24.2 | 20.5 | | 9.0 | Considerably worn. |
| Do | 164927 | ...do | | 36.8 | | 23.9 | 20.3 | 14.0 | 8.6 | Moderately worn. |
| Do | 164928 | ...do | | 37.2 | | 23.8 | 20.2 | 13.7 | 8.8 | Do |
| Do | 164934 | ...do | | 37.1 | | 24.2 | 20.7 | 14.1 | 8.7 | Do. |
| Do | 164936 | ...do | | | | 23.7 | 20.4 | | 8.3 | Much worn. |
| Do | 164937 | ...do | | | | 23.5 | 21.2 | 13.4 | 8.7 | Moderately worn. |
| Do | 164919 | Female | 78 | 36.2 | | 24.5 | 21.2 | 14.2 | 9.0 | Do. |
| Do | 164920 | ...do | 81 | 37.5 | | 23.8 | 20.7 | 13.7 | 8.8 | Do. |
| Do | 164921 | ...do | 75 | 37.4 | | 23.5 | 20.2 | 13.7 | 8.5 | Unworn. |
| Do | 164922 | ...do | | 36.5 | | 23.6 | 20.7 | | 8.8 | Do. |
| Do | 164923 | ...do | | 40.3 | | 24.4 | 21.1 | 13.9 | 8.7 | Moderately worn. |
| Do | 164926 | ...do | | 37.8 | | 23.6 | 20.5 | 13.8 | 8.5 | Unworn. |
| Do | 164929 | ...do | | 37.5 | | 24.6 | 21.3 | 14.5 | 8.9 | Considerably worn. |
| Do | 164930 | ...do | | 37.8 | | 23.7 | 20.8 | 14.5 | 8.5 | Little worn. |
| Do | 164931 | ...do | | 38.3 | | 23.9 | 21.1 | | 8.5 | Considerably worn. |
| Do | 164932 | ...do | | 38.9 | 56.0 | 24.3 | | 14.0 | 8.8 | Little worn. |
| Do | 164933 | ...do | | 38.8 | | 23.6 | 20.5 | 14.3 | 8.4 | Considerably worn. |
| Uganda: Mnyouri Jardin | 164938 | ...do | | | | 24.3 | 20.5 | | 8.8 | Do. |

[1] Type in alcohol.

LAVIA FRONS AFFINIS Andersen and Wroughton.

1907. *Lavia frons affinis* Andersen and Wroughton, Ann. and Mag. Nat. Hist., ser. 7, vol. 19, p. 140. February. (Kaka, White Nile; type in British Museum.)

1910. *Lavia frons affinis* Roosevelt, African Game Trails, Amer. ed., p. 474; London ed., p. 486.

1910. *Lavia frons* Roosevelt, African Game Trails, Amer. ed., p. 487; London ed., p. 498. (Part.)

*Specimens.*—Sixty, from the following localities:

Sudan: Renk, 2 in alcohol (Mearns); Shambe, 2 in alcohol (Heller); White Nile below Lake No, 2 in alcohol (Mearns).

Lado: Rhino Camp, 47, including 25 in alcohol (Loring, Mearns).

Uganda: Gondokoro, 1 in alcohol (Mearns); Mnyouri Jardin, 1 (Loring); Nimule, 4, including 3 in alcohol (Heller); Uma River, 1 in alcohol, (Mearns).

In addition to the accompanying table of measurements of skins and skulls of *Lavia*, the following dimensions of forearms of alcoholic specimens of the two races are presented:

*Lavia frons rex.*

Southern Guaso Nyiro River: 60, 62, 59, 60, 57, 60, 62.
Ulukenia Hills: 58, 60.
Sotik: 58, 62.
Kisumu: 62, 60.
Average, 60.

*Lavia frons affinis.*

Nimule: 56.
Rhino Camp: 60, 56, 58, 59, 61, 58, 56, 59, 59, 58, 58, 59, 60, 62, 58.
Gondokoro: 56.
Renk: 57, 59.
Uma River: 58.
Average, 58.

For complete table of measurements see pages 78–79.

Colonel Roosevelt, in African Game Trails,[1] has the following notes on this bat, as he observed it in the Lado:

> They were very abundant, hanging in the thinly leaved acacias around the tents, and, as everywhere else, were crepuscular; indeed to a large extent actually diurnal in habit. They saw well and flew well by daylight, passing the time hanging from twigs. They became active before sunset. In catching insects they behaved not like swallows but like flycatchers. Except that they perched upside down, so to speak—that is that they hung from twigs instead of sitting on them—their conduct was precisely that of a phoebe bird or a wood peewee. Each bat hung from its twig until it espied a passing insect, when it swooped down upon it, and after a short flight returned with its booty to the same perch or went on to a new one close by; and it kept twitching its long ears as it hung head downward devouring its prey.

[1] African Game Trails, p. 399. 1910.

*Measurements of specimens of Cardioderma cor.*

| Locality. | No. | Sex. | Head and body. | Ear from notch. | Fore-arm. | Skull: Greatest length. | Condylo-basal length. | Zygomatic breadth. | Greatest breadth across molars. | Entire upper tooth row. | Observations. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Abyssinia: Ogaden | 142545 | Female | 70 | 40.0 | 55 | 25.5 | 22.5 | 14.6 | 9.1 | 9.5 | Alcoholic; teeth much worn. |
| B. E. A.: Archer's Post | 182663 | Male | 77 | 37.2 | 56 | ..... | 23.3 | 16.0 | 9.5 | 10.4 | Teeth much worn. |
| Do | 182664 | ...do | 70 | 35.5 | 57 | 26.3 | 23.1 | 16.0 | 10.0 | 10.3 | Do. |
| Do | 184317 | Female | 73 | 40.2 | 59 | ..... | ..... | ..... | ..... | ..... | Alcoholic. |
| G. E. A.: Mount Kilimanjaro | 18994 | Male | 74 | 37.0 | 54 | 26.0 | 22.9 | 15.7 | 9.2 | 10.1 | Alcoholic; teeth moderately worn. |



### Genus CARDIODERMA Peters.

1873. *Cardioderma* PETERS, Mon.-ber. K. Preuss. Akad. Wiss., Berlin, p. 488. (*C. cor.*)

The single known species of big-eared bats of the genus *Cardioderma* is rare in collections. It was not found by the Smithsonian African Expedition, and was collected by the Rainey Expedition at only one station.

#### CARDIODERMA COR (Peters).

1872. *Megaderma cor* PETERS, Mon.-ber. K. Preuss. Akad. Wiss., Berlin, p. 194. (Abyssinia; type in Berlin Museum.)

1892. *Megaderma cor* TRUE, Proc. U. S. Nat. Mus., vol. 15, p. 468.

*Specimens.*—Seven, from localities as follows:

ABYSSINIA: Ogaden, 2 in alcohol (Ruspoli).

BRITISH EAST AFRICA: Archer's Post, Northern Guaso Nyiro, 4 (Heller).

GERMAN EAST AFRICA: Mount Kilimanjaro, 1 in alcohol (Abbott).

A female collected at Archer's Post August 18 had a large blind and naked young hanging on her breast. The mammæ are 1/1 anal.

Doctor True[1] lists an additional specimen from Taveta, British East Africa, but this can not now be found in the collection.

For measurements see accompanying table.

## Family RHINOLOPHIDÆ.

### Genus RHINOLOPHUS Lacépède.

1799. *Rhinolophus* LACÉPÈDE, Tabl. des Mamm., p. 15. (*R. ferrumequinum.*)

Four out of six of the species of horseshoe bats which are known from the regions visited were collected by the Smithsonian and Rainey expeditions. Of the overlooked forms, *Rhinolophus fumigatus exsul* was described from Kitui, Ukamba District, British East Africa, and *R. deckenii* from the Zanzibar coast.

For tables of measurements of specimens see pages 82–83.

[1] Proc. U. S. Nat. Mus., vol. 15, 1892, p. 468.

*Measurements of specimens of Rhinolophus from British East Africa.*

| Form and locality. | No. | Sex. | Forearm. | Skull: Greatest length. | Condylo-basal length. | Zygo-matic breadth. | Mandi-ble. | Front of upper canine to back of $m^3$. | Front of lower canine to back of $m_3$. | Observations. |
|---|---|---|---|---|---|---|---|---|---|---|
| *R. eloquens.* | | | | | | | | | | |
| Nyuki River | 182667 | Male | 56 | 25.2 | 22.8 | 12.8 | 16.5 | 8.8 | 9.4 | Teeth little worn. |
| Do | 182668 | ...do | 57 | 24.9 | 22.5 | 12.7 | 17.0 | 9.1 | 9.8 | Teeth moderately worn. |
| Do | 184324 | ...do | 57 | | | | | | | Alcoholic. |
| Do | 184327 | ...do | 60 | | | | | | | Do. |
| Do | 184328 | ...do | 57 | | | | | | | Do. |
| Do | 184331 | ...do | 58 | | | | | | | Do. |
| Do | 184332 | ...do | 59 | | | | | | | Do. |
| Do | 182665 | Female | 61 | 25.6 | 23.0 | 12.5 | 17.2 | 9.0 | 9.7 | Teeth little worn. |
| Do | 182666 | ...do | 57 | 24.4 | 22.3 | 12.7 | 16.3 | 8.8 | 9.3 | Teeth unworn. |
| Do | 184323 | ...do | 59 | | | | | | | Alcoholic. |
| Do | 184325 | ...do | 59 | | | | | | | Do. |
| Do | 184326 | ...do | 59 | | | | | | | Do. |
| Do | 184329 | ...do | 60 | | | | | | | Do. |
| Do | 184330 | ...do | 60 | | | | | | | Do. |
| Lake Naivasha | 162090 | Male | 58 | 25.8 | 23.1 | 12.8 | 17.0 | 9.1 | 9.5 | Teeth much worn. |
| Do | 162093 | ...do | 60 | 26.9 | 24.2 | 12.9 | 17.6 | 9.4 | 10.0 | Do. |
| Do | 162094 | ...do | 56 | 26.3 | 23.7 | 13.1 | 17.6 | 9.5 | 10.2 | Teeth moderately worn. |
| Do | 162095 | ...do | 59 | 25.7 | 23.1 | 13.0 | 16.7 | 9.4 | 9.8 | Do. |
| Do | 162096 | ...do | 57 | | | 12.8 | 17.4 | 9.2 | 9.9 | Teeth little worn. |
| Do | 162097 | ...do | 59 | 26.7 | 23.9 | 12.9 | 17.6 | 9.0 | 9.8 | Teeth moderately worn. |
| Do | 162098 | ...do | | 25.7 | 22.8 | 12.6 | 17.0 | 8.9 | 9.4 | Do. |
| Do | 162099 | ...do | 57 | 25.1 | 22.8 | 12.5 | 16.9 | 9.2 | 9.6 | Teeth little worn. |
| Do | 166350 | ...do | 58 | | | | | | | Alcoholic. |
| Do | 166353 | ...do | 60 | | | | | | | Do. |
| Do | 166364 | ...do | 60 | | | | | | | Do. |
| Do | 166368 | ...do | 60 | | | | | | | Do. |
| Do | 166369 | ...do | 58 | | | | | | | Do. |
| Do | 166371 | ...do | 58 | | | | | | | Do. |
| Do | 166372 | ...do | 57 | | | | | | | Do. |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| *R. eloquens*—Continued. | | | | | | | | | | |
| Lake Naivasha | 166373 | Male | 58 | | | | | | | Do. |
| Do | 166387 | ...do | 57 | | | | | | | Do. |
| Do | 162091 | Female | 58 | 26.1 | 23.7 | | 17.3 | 9.0 | 9.7 | Teeth much worn. |
| Do | 166351 | ...do | 59 | | | | | | | Alcoholic. |
| Do | 166370 | ...do | 58 | | | | | | | Do. |
| So. Guaso Nyiro | 166366 | Male | 58 | | | | | | | Do. |
| *R. keniensis.* | | | | | | | | | | |
| Mount Kenia | [1] 166352 | Male | 52 | 22.8 | 20.4 | 12.0 | 15.0 | 8.6 | 9.0 | Alcoholic, skull removed. |
| *R. lobatus.* | | | | | | | | | | |
| Lake Naivasha | 162100 | Male | 43 | 18.6 | 16.8 | 9.5 | 11.9 | 6.5 | 7.1 | Teeth unworn. |
| Kijabe | 166354 | ...do | 44 | | | | | | | Alcoholic. |
| Do | 166357 | ...do | 44 | | | | | | | Do. |
| Do | 166358 | ...do | 44 | | | | | | | Do. |
| Do | 166374 | ...do | 44 | | | | | | | Do. |
| Do | 166375 | ...do | 45 | | | | | | | Do. |
| Do | 166376 | ...do | 44 | | | | | | | Do. |
| Do | 166377 | ...do | 45 | | | | | | | Do. |
| Do | 166378 | ...do | 43 | | | | | | | Do. |
| Do | 166379 | ...do | 44 | | | | | | | Do. |
| Do | 166380 | ...do | 44 | | | | | | | Do. |
| Do | 166381 | ...do | 44 | | | | | | | Do. |
| Do | 166356 | Female | 44 | | | | | | | Do. |
| Do | 166359 | ...do | 45 | | | | | | | Do. |
| Do | 166360 | ...do | 44 | | | | | | | Do. |
| Do | 166361 | ...do | 45 | | | | | | | Do. |
| Do | 166362 | ...do | 46 | | | | | | | Do. |
| Do | 166363 | ...do | 43 | | | | | | | Do. |
| Do | 166382 | ...do | 44 | | | | | | | Do. |

[1] Type.

RHINOLOPHUS HILDEBRANDTII Peters.

1878. *Rhinolophus hildebrandtii* PETERS, Mon.-ber. K. Preuss. Akad. Wiss., Berlin, p. 195. (Ndi, British East Africa; type in Berlin Museum.)

*Specimens.*—Two, in alcohol, from:

BRITISH EAST AFRICA: Ulukenia Hills (Loring).

One of these specimens is an old male, with forearm measuring 64 millimeters; the other is quite young and is considerably smaller. The species is readily distinguished from its near relative, *R. eloquens*, by its much larger size.

RHINOLOPHUS ELOQUENS Andersen.

1905. *Rhinolophus hildebrandti eloquens* ANDERSEN, Ann. and Mag. Nat. Hist., ser. 7, vol. 15, p. 74. January. (Entebbe, Uganda; type in British Museum.)

1905. *Rh[inolophus] eloquens* ANDERSEN, Ann. and Mag. Nat. Hist., ser. 7, vol. 16, p. 651. December.

1910. *Rhinolophus hildebrandti eloquens* ROOSEVELT, African Game Trails, Amer. ed., p. 474; London ed., p. 486.

*Specimens.*—Forty, from the following localities:

BRITISH EAST AFRICA: Lake Naivasha, 25, including 15 in alcohol (Mearns, Heller, Loring); Nyuki River, Northern Guaso Nyiro, 14, including 10 in alcohol (Heller); Southern Guaso Nyiro River, 1 in alcohol (Heller).

The Naivasha specimens were taken from a cave near the south end of the lake. The Nyuki River specimens were captured by Heller in a rock cave on the lower river. Doctor Mearns records seeing these bats flying among the trees at Lake Naivasha at twilight. Andersen [1] refers specimens from Machakos and Kenia to *Rhinolophus hildebrandtii* rather than to *R. eloquens*. These specimens from British East Africa, as may be seen from the accompanying table of measurements, agree well in size with true *eloquens* from Uganda, and run far too small for *hildebrandtii*.

RHINOLOPHUS KENIENSIS Hollister.

Plate 10, figs. 11, 12.

1916. *Rhinolophus keniensis* HOLLISTER, Smithsonian Misc. Coll., vol. 66, No. 1, p. 2. February 10. (Mount Kenia, British East Africa; type in U. S. Nat. Mus.)

*Specimen.*—One, the type in alcohol, from—

BRITISH EAST AFRICA: West side of Mount Kenia (Heller).

This form is closely allied to *Rhinolophus augur* of South Africa, and will doubtless prove to be a subspecies, intergrading through *R. a. zambesiensis*. The latter has been recorded from Mount Kilimanjaro by Doctor Lönnberg [2] and by Mr. Oldfield Thomas.[3]

RHINOLOPHUS LOBATUS Peters.

1852. *Rhinolophus lobatus* PETERS, Reise Mossambique, Säugethiere, p. 41. (Sena, Portuguese East Africa; type in Berlin Museum.)

*Specimens.*—Twenty, from localities as follows:

BRITISH EAST AFRICA: Kijabe Station, 19 in alcohol (Loring); Lake Naivasha, 1 (Loring).

[1] Ann. and Mag. Nat. Hist., ser. 7, vol. 16, 1905, p. 651.

[2] Wiss. Erg. Schwedischen Zool. Exp. Kilimandjaro, Mamm., pp. 8–10. 1908.

[3] Ann. and Mag. Nat. Hist., ser. 8, vol. 11, p. 315. March, 1913.

## Family HIPPOSIDERIDÆ.

### Genus HIPPOSIDEROS Gray.

1831. *Hipposideros* Gray, Zool. Misc., p. 37. (*H. speoris.*)
1871. *Ptychorhina* Peters, Mon.-ber. K. Preuss. Akad. Wiss. Berlin, p. 325. (*H. caffer.*)

All the recognized forms of this genus of nose-leaf bats which are known from the region are represented in the collection.

#### HIPPOSIDEROS CAFFER (Sundevall).

1847. *Rhinolophus caffer* Sundevall, Öfv. Kongl. Vet.-Akad. Förh., 1846, p. 118. (Near Port Natal, Natal; type in Stockholm Museum.)

*Specimens.*—Sixty, from the following localities:

Uganda: Gondokoro, 30, including 21 in alcohol (Loring).

British East Africa: Archer's Post, 1 (Heller); Juja Farm, 1 in alcohol (Mearns); Kijabe, 1 in alcohol (Loring); Nairobi, 3, including 2 in alcohol (Mearns, Heller, Loring); Nairobi River, 1 in alcohol (Mearns); Northern Guaso Nyiro, 1 in alcohol (Mearns); Southern Guaso Nyiro, 21 in alcohol (Heller).

Zanzibar: Zanzibar, 1 in alcohol (Weddell).

As will be seen from the accompanying measurements this species is readily separable from the next by size alone. Although the dimensions of forearms "overlap," there is never the slightest doubt about which species a specimen should be referred to when the skull is examined, and alcoholic specimens of the two species may be separated easily by general bulk and by size and length of head. Among our sixty specimens there are very few representing the red phase, which seems to be rare, quite contrary to the case with the larger species.[1] In examining alcoholic material from the Southern Guaso Nyiro, several specimens of the parasitic Nycteribiidæ were found.

#### HIPPOSIDEROS RUBER (Noack).

1893. *Phyllorhina rubra* Noack, Zool. Jahrb., Syst., vol. 7, p. 586. December 23. ("Lugerrunjere-Fluss," German East Africa; type in Berlin Museum.)
1906. *Hipposiderus caffer centralis* Andersen, Ann. and Mag. Nat. Hist., ser. 7, vol. 17, p. 277. March. (Entebbe, Uganda; type in British Museum.)
1910. *Hipposiderus caffer centralis* Roosevelt, African Game Trails, Amer. ed., p. 474; London ed., p. 486.

*Specimens.*—Eighty-nine, from localities as follows:

Sudan: Bor, 1 in alcohol (Heller).

Uganda: Gondokoro, 87, including 71 in alcohol (Loring).

British East Africa: Nairobi, 1 in alcohol (Mearns).

A large per cent of the specimens of this species are in the red phase. The species is usually readily separable from *Hipposideros caffer* by bulk alone; it is a much heavier animal, with decidedly

[1] In this connection see a recent paper by Dr. Knud Andersen, "On the So-called Colour Phases of the Rufous Horseshoe-bat of India (*Rhinolophus rouxi*, Temm.)," Journ. Bombay Nat. Hist. Soc., vol. 25, No. 2, pp. 260–273, pls. 1, 2. September 15, 1917.

larger head and longer, more powerful forearm. The great difference in the size of the head is perhaps the best character to separate specimens in spirits, unless the skull be removed. The length of forearm is not always diagnostic, but there is never any doubt of the species when the skull is examined.

In describing *Hipposideros caffer centralis*, Doctor Andersen considered his new form a subspecies of *caffer*, and believed that only the large form occurred in Uganda. That such is not the case is plainly shown by our excellent series from Gondokoro, where the two species occur together without any indication of intermediate specimens. The type-specimen of Noack's *Phyllorhina rubra*, which Andersen considered one of two known specimens intermediate between *caffer* and *centralis*, but nearer to *caffer*, is, so far as size is concerned, perfectly typical of his *centralis*. The accompanying table of measurements of specimens from which skulls have been removed makes this very plain. Out of the 149 specimens of the two species in our collection there is no trace of intergradation, and the differences between the two species are so great that any blending seems quite improbable. The great difference in bulk between skulls of the two species is poorly indicated by the measurements.

In addition to the dimensions of specimens with skulls listed in the accompanying table, the following measurements have been taken of the forearms of alcoholic specimens of the two species, *caffer* and *ruber:*

*Hipposideros caffer.*

Gondokoro: 47, 46, 47, 45, 47, 47, 46, 47, 47, 48, 49, 48, 47, 48, 48, 47, 48, 47, 48, 48, 46.

Northern Guaso Nyiro: 47.

Nairobi River: 48.

Nairobi: 48, 48.

Kijabe: 50.

Juja Farm: 49.

Southern Guaso Nyiro: 51, 51, 50, 50, 50, 50, 50, 50, 50, 50, 51.

Zanzibar: 46.

*Hipposideros ruber.*

Bor: 52.

Gondokoro: 54, 54, 53, 52, 55, 53, 53, 53, 52, 53, 53, 52, 55, 53, 51, 52, 52, 54, 52, 51, 53, 54, 54, 51, 53, 54, 54, 53, 52, 52, 51, 53, 51, 51, 52, 54, 52, 50, 51, 55, 54, 53, 52, 53, 53, 52, 53, 51, 54, 52, 51, 51, 52, 50, 50, 53, 53, 53, 52, 54, 53, 53, 52, 53, 53, 52, 53, 52, 53, 54, 52.

Nairobi: 51.

For complete tables of measurements of specimens see pages 87–88.

*Measurements of specimens of Hipposideros caffer and H. ruber.*

| Species and locality. | No. | Sex. | Fore-arm. | Skull: Greatest length. | Condylo-basal length. | Zygo-matic breadth. | Mastoid breadth. | Greatest breadth across outer corners of $m^3$. | Breadth across upper canines. | Maxil-lary tooth row, in-cluding canine. | Observations. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *H. caffer.* | | | | | | | | | | | |
| B. E. A.: | | | | | | | | | | | |
| S. Guaso Nyiro | 166506 | Male | 49 | 17.1 | 14.8 | 8.8 | 9.1 | 6.3 | 3.8 | 5.9 | Teeth little worn. |
| Do | 166488 | Female | 52 | 17.6 | 15.4 | 9.5 | 9.6 | 6.1 | | 5.9 | Teeth moderately worn. |
| Do | 166489 | ...do | 48 | 17.3 | 14.9 | 9.0 | 9.3 | 5.9 | 3.7 | 5.7 | Teeth little worn. |
| Do | 166491 | ...do | 49 | 16.9 | 14.4 | 8.9 | 9.2 | 6.3 | 3.6 | 5.8 | Teeth moderately worn. |
| Do | 166492 | ...do | 48 | 17.3 | 15.1 | 9.2 | 9.2 | 6.0 | 3.8 | 5.9 | Do. |
| Do | 166494 | ...do | 48 | 17.7 | 15.1 | 9.1 | 9.4 | 6.1 | 3.7 | 5.7 | Do. |
| Do | 166496 | ...do | 49 | 17.4 | 15.2 | 9.2 | 9.4 | 6.3 | 3.7 | 5.7 | Do. |
| Do | 166497 | ...do | 48 | 17.3 | 14.9 | 9.0 | 9.3 | 5.9 | 3.5 | 5.7 | Do. |
| Do | 166499 | ...do | 50 | 17.4 | 15.4 | 9.1 | 9.2 | 6.0 | 3.8 | 5.9 | Do. |
| Do | 166500 | ...do | 50 | 17.3 | 15.0 | | | 6.1 | 3.5 | 5.8 | Teeth little worn. |
| Nairobi | 164021 | Male | 47 | 17.1 | 14.8 | 9.3 | 9.3 | 6.2 | 3.6 | 5.8 | Teeth moderately worn. |
| Archer's Post | 182669 | ...do | 46 | | | 9.0 | 9.0 | 5.9 | 4.0 | 5.8 | Teeth little worn. |
| Jganda: | | | | | | | | | | | |
| Gondokoro | 164939 | ...do | | 17.2 | 14.8 | | | 6.1 | 3.9 | 5.7 | Do. |
| Do | 164945 | ...do | | 16.7 | 14.4 | 9.0 | 9.0 | 6.1 | 3.7 | 5.7 | Teeth moderately worn. |
| Do | 164946 | ...do | | 17.2 | 14.6 | | 9.4 | | | 5.7 | Teeth little worn. |
| Do | 164947 | ...do | 46 | 17.2 | 14.9 | 9.0 | 9.2 | 5.9 | 3.6 | 5.8 | Do. |
| Do | 164950 | ...do | | 17.1 | 15.1 | 9.3 | 9.2 | 6.0 | 3.7 | 5.7 | Teeth considerably worn. |
| Do | 164951 | ...do | | 16.8 | 14.4 | 8.8 | 9.0 | 5.8 | 3.6 | 5.7 | Teeth moderately worn. |
| Do | 164952 | ...do | | 16.7 | 14.4 | 9.0 | 8.9 | 5.7 | 3.6 | 5.6 | Teeth unworn. |
| *H. ruber.* | | | | | | | | | | | |
| German East Africa | | Male | 51 | | | 10.2 | | 6.7 | 4.5 | 6.4 | Type in Berlin Mus. |
| Jganda: | | | | | | | | | | | |
| Gondokoro | 164944 | ...do | | 19.1 | 16.7 | 10.4 | 10.1 | 6.9 | 4.7 | 6.8 | Teeth moderately worn. |
| Do | 164949 | ...do | | 19.0 | 16.8 | 10.2 | 9.9 | 7.0 | 4.6 | 6.7 | Do. |
| Do | 164953 | ...do | | 18.9 | | 10.6 | 10.2 | 7.2 | 4.7 | 6.7 | Teeth little worn. |
| Do | 164961 | ...do | 50 | 19.5 | | 10.6 | 10.3 | 7.2 | 4.7 | 7.0 | Teeth moderately worn. |

*Measurements of specimens of Hipposideros caffer and H. ruber*—Continued.

| Species and locality. | No. | Sex. | Fore-arm. | Skull: Greatest length. | Condylo-basal length. | Zygo-matic breadth. | Mastoid breadth. | Greatest breadth across outer corners of *m*³. | Breadth across upper canines. | Maxil-lary tooth row, in-cluding canine. | Observations. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *H. ruber*—Continued. | | | | | | | | | | | |
| Gondokoro | 164962 | ..... | ..... | 18.9 | 16.3 | 10.3 | 10.1 | 7.0 | 4.7 | 6.8 | Teeth little worn. |
| Do | 164963 | ...do..... | 52 | 19.1 | 16.8 | 10.6 | 10.0 | 7.2 | 4.5 | 6.8 | Do. |
| Do | 164940 | Female | ..... | 18.9 | 16.3 | 10.0 | 10.1 | 6.8 | 4.4 | 6.6 | Do. |
| Do | 164941 | ...do..... | ..... | 19.7 | 17.2 | 10.7 | 10.2 | 7.0 | 4.5 | 7.0 | Teeth moderately worn. |
| Do | 164943 | ...do..... | 50 | 19.4 | 17.3 | 10.5 | 10.0 | 7.1 | 4.4 | 6.9 | Teeth little worn. |
| Do | 164955 | ...do..... | 50 | 19.1 | 16.6 | 10.2 | 10.0 | 7.0 | 4.4 | 6.8 | Teeth moderately worn. |
| Do | 164954 | ...do..... | 50 | 19.8 | 17.4 | 10.8 | 10.1 | 7.3 | 4.5 | 6.9 | Do. |
| Do | 164956 | ...do..... | 51 | ..... | ..... | 10.5 | 9.9 | 7.0 | 4.8 | 6.8 | Do. |
| Do | 164957 | ...do..... | 51 | 19.6 | 17.4 | 10.5 | 10.2 | 7.1 | 4.8 | 6.8 | Do. |
| Do | 164958 | ...do..... | 52 | 19.5 | 17.0 | 10.4 | 10.0 | 7.1 | 4.6 | 6.9 | Do. |
| Do | 164960 | ...do..... | ..... | 19.6 | 17.3 | 10.5 | 10.0 | 6.9 | 4.5 | 6.8 | Do. |

**HIPPOSIDEROS COMMERSONII MARUNGENSIS (Noack).**

1887. *Phyllorhina commersonii* Peters, var. *marungensis* NOACK, Zool. Jahrb., Syst., vol. 2, p. 272. May 7. (Qua Mpala, Marungu, Congo.)

*Specimen.*—One in alcohol:

ZANZIBAR: Zanzibar (Weddell).

**Genus ASELLIA Gray.**

1838. *Asellia* GRAY, Mag. Zool. and Bot., vol. 2, p. 493. (*A. tridens.*)

The single African species of this genus of nose-leaf bats is well represented in the museum by specimens from Egypt, but by only one specimen from within the geographical limits of the present report.

**ASELLIA TRIDENS (Geoffroy).**

1813. *Rhinolophus tridens* GEOFFROY, Descr. l'Égypte, vol. 2, p. 127. (Tombs of the Kings and temple of Denderah, Egypt.)

1816. *Rh*[*inolophus*] *tridens* OKEN, Lehrb. Nat., 3ter Theil, 2te Abth., p. 922.

*Specimen.*—One in alcohol from—

SUDAN: Shendi (Rothschild).

## Family VESPERTILIONIDÆ.

**Genus MYOTIS Kaup.**

1829. *Myotis* KAUP, Skizz. Entw.-Gesch. Nat. Syst. Europ. Thierw., p. 106. (*M. myotis.*)

A single species of *Myotis* is known from British East

Africa. It is apparently a rare bat, as no specimens were collected by either of the large expeditions.

MYOTIS HILDEGARDEÆ Thomas.

1904. *Myotis hildegardeæ* Thomas, Ann. and Mag. Nat. Hist., ser. 7, vol. 13, p. 209. March. (Fort Hall, British East Africa; type in British Museum.)

*Specimens.*—Two, as follows:

British East Africa: Yala River (Turner).

Both of these specimens have abnormal dentition. In each $pm^3$ is wanting on both sides, and in one skull $pm_3$ is absent also. The measurements of the two specimens follow, the first dimensions given are of an adult male, the second of an adult female. Head and body, 48, 47; tail, 44, 42; foot, 9.5, 9; ear, 15, 12.3; forearm, 38.5, 38. Skull: Greatest length, 15.1, 14.8; condylobasal length, 14, 13.7; zygomatic breadth, 9.5, 9.3; breadth of braincase, 7.6, 7.6; interorbital breadth, 3.7, 3.8; length of mandible, 10.7, 10.6. Teeth: Upper row, front of canine to back of $m^3$, 5.5, 5.4; lower row, front of canine to back of $m_3$, 6, 5.9.

This interesting addition to our collection of African bats was made by Mr. H. J. A. Turner, who collected the specimens November 25 and December 1, 1913.

Genus PIPISTRELLUS Kaup.

1829. *Pipistrellus* Kaup, Skizz. Entw.-Gesch. Nat. Syst. Europ. Thierw., p. 98. (*P. pipistrellus.*)

Five distinct species of the diminutive pipistrelles are included in the collections. One of these, *Pipistrellus rüppelii*, has been placed by Miller [1] in the genus *Scotozous* Dobson. The characters separating *Scotozous* from *Pipistrellus* are not well marked, and *rüppelii*, in a measure, combines features of the two genera. It seems best, therefore, to retain it within the limits of true *Pipistrellus*. Of the three skulls of *rüppelii* examined, two show distinctly a secondary posterior cusp on the upper canines, and in one skull this cusp is more conspicuous than is usual in several species ordinarily referred to true *Pipistrellus*.

For measurements of specimens see table, page 91.

PIPISTRELLUS NANUS (Peters).

1852. *Vespertilio nanus* Peters, Reise Mossambique, Säugethiere, p. 63. (Inhambane, Portuguese East Africa.)

1910. *Pipistrellus nanus* Thomas and Wroughton, Trans. Zool. Soc. London, vol. 19, p. 488. March.

1917. *Pipistrellus nanus* Allen, Bull. Amer. Mus. Nat. Hist., vol. 37, p. 441. September 29.

*Specimens.*—Ten, from localities as follows:

Uganda: Mubuku Valley, East Ruwenzori, 5,000 feet, 1 (Woosnam).

British East Africa: Yala River, 9 (Turner).

Of his Ruwenzori specimens, one of which is listed above, Mr. R. B. Woosnam has written:

> These little bats inhabited chiefly the banana plantations, and were found on Ruwenzori up to 6,000 feet.[2]

[1] Bull. 57, U. S. Nat. Mus., p. 206. 1907.

[2] Trans. Zool. Soc. London, vol. 19, p. 489. March, 1910.

PIPISTRELLUS HELIOS Heller.

Plate 10, figs. 13, 14.

1912. *Pipistrellus helios* Heller, Smithsonian Misc. Coll., vol. 60, No. 12, p. 3. November 4. (Merelle Water, 30 miles south of Mt. Marsabit, British East Africa; type in U. S. Nat. Mus.)

*Specimens.*—Sixteen, from localities as follows:

British East Africa: Archer's Post, 3 in alcohol (Heller); Lakiundu River, 5, including 3 in alcohol (Heller); Merelle Water, Marsabit Road, 7, including 6 in alcohol (Heller); Northern Guaso Nyiro, 1 (Percival).

This bat agrees in many particulars with the description of *Pipistrellus deserti* Thomas [1] from Tripoli, which has been recorded from British East Africa by Allen [2] and by Dollman.[3] There are certain marked discrepancies in dimensions, however, and Miller, after study of the type-specimen of *deserti*, placed that species in the genus *Scotozous*.[4] This would appear to mean that *deserti* has a very minute outer upper incisor, whereas in *helios* that tooth is particularly large, almost equaling in size the larger inner incisor.

PIPISTRELLUS AERO Heller.

Plate 10, figs. 15, 16.

1912. *Pipistrellus aero* Heller, Smithsonian Misc. Coll., vol. 60, No. 12, p. 3. November 4. (Mount Gargues, Mathews Range, 7,000 feet, British East Africa; type in U. S. Nat. Mus.)

1917. *Pipistrellus nanus* Allen, Bull. Amer. Mus. Nat. Hist., vol. 37, pp. 441, 442. September 29.

*Specimens.*—Five, including two in alcohol, as follows:

British East Africa: Mount Gargues (Heller).

Heller notes that this species was seen only in the heavy forest on the summit of Mount Gargues, 7,000 to 7,100 feet altitude. Numbers were seen at dusk every evening, but no other species was noted at so high an elevation.

PIPISTRELLUS KUHLII FUSCATUS Thomas.

1901. *Pipistrellus kuhlii fuscatus* Thomas, Ann. and Mag. Nat. Hist., ser. 7, vol. 8, p. 34. July. (Naivasha, British East Africa; type in British Museum.)

1910. *Pipistrellus kuhlii fuscatus* Roosevelt, African Game Trails, Amer. ed., pp. 474 and 480; London ed., pp. 486 and 491.

*Specimens.*—Five, from localities as follows:

British East Africa: Engare Narok River, 1 (Loring); Kabalolot Hill, Sotik, 1 in alcohol (Heller); Lake Naivasha, 2, including 1 in alcohol (Mearns, Heller); Nairobi, 1 (Heller).

PIPISTRELLUS RÜPPELII (Fischer).

1829. *V[espertilio] rüppelii* Fischer, Syn. Mamm., p. 109. (Dongola, Sudan.)

*Specimens.*—Nine, including 6 in alcohol, as follows:

Sudan: Khartoum (Heller, Loring).

[1] Proc. Zool. Soc. London, vol. 2, p. 4. 1902.
[2] Bull. Mus. Comp. Zool., vol. 54, p. 325. December, 1911.
[3] Proc. Zool. Soc. London., 1914, p. 308. June, 1914.
[4] Bull. 57, U. S. Nat. Mus., p. 206. 1907.

*Measurements of specimens of Pipistrellus.*

| Form and locality. | No. | Sex. | Forearm. | Skull: Greatest length. | Condylobasal length. | Zygomatic breadth. | Breadth of braincase. | Depth of braincase. | Mandible. | Maxillary tooth row. | Condition of teeth. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *P. nanus.* | | | | | | | | | | | |
| Uganda: Ruwenzori | 172925 | Female | 32 | 11.8 | 10.9 | ..... | 5.9 | 4.0 | 7.9 | 3.8 | Little worn. |
| B. E. A.: Yala River | 197945 | Male | 32 | 11.5 | 10.7 | 6.8 | 5.9 | 4.2 | 7.8 | 3.7 | Moderately worn. |
| Do | 197946 | ...do | 31 | 11.7 | 10.7 | ..... | 5.9 | 3 | 7.8 | 3.8 | Much worn. |
| Do | 197952 | ...do | 31 | 11.8 | 10.6 | ..... | 5.9 | 4.2 | 7.7 | 3.7 | Little worn. |
| Do | 197947 | Female | 32 | 11.6 | 10.7 | 7.3 | 5.9 | 3.9 | 8.0 | 3.8 | Do. |
| Do | 197948 | ...do | 32 | 11.8 | 11.0 | 6.9 | 5.7 | 4.2 | 8.1 | 4.1 | Do. |
| Do | 197949 | ...do | 32 | 11.4 | 10.8 | 6.8 | 5.8 | 4.0 | 8.0 | 3.7 | Do. |
| Do | 197950 | ...do | 28 | 11.3 | 10.1 | ..... | 6.0 | ..... | ..... | ..... | Last molar not in line. |
| Do | 197951 | ...do | 32 | 12.0 | 10.8 | ..... | 5.8 | 4.2 | 8.2 | 4.0 | Moderately worn. |
| Do | 197953 | ...do | 32 | 11.6 | 10.7 | ..... | 6.1 | 4.3 | 7.8 | 3.8 | Do. |
| *P. helios.* | | | | | | | | | | | |
| B. E. A.: | | | | | | | | | | | |
| Lakiundu River | [1] 181813 | Male | 27 | 11.3 | 10.3 | 6.6 | 6.0 | 4.4 | 7.5 | 3.6 | Considerably worn. |
| Do | 182671 | ...do | 28 | 11.2 | 10.0 | ..... | 6.0 | 4.5 | 7.3 | 3.7 | Little worn. |
| Do | 182672 | ...do | 28 | 10.9 | 9.6 | ..... | 5.8 | ..... | 7.5 | 3.8 | Unworn. |
| Merelle water | 182673 | ..... | ..... | 11.4 | 10.3 | ..... | 5.7 | 4.2 | 7.7 | 3.7 | Do. |
| N. Guaso Nyiro | 182670 | Female | 28 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | ..... |
| *P. aero.* | | | | | | | | | | | |
| B. E. A.: Mount Gargues | [1] 181812 | Male | 31 | 12.3 | 11.6 | 8.1 | 6.8 | 4.6 | 8.6 | 4.5 | Little worn. |
| Do | 182674 | ...do | 32 | ..... | ..... | ..... | ..... | ..... | 9.0 | 4.6 | Do. |
| Do | 182675 | ...do | 31 | 12.6 | 11.6 | 8.2 | 6.6 | 4.7 | 9.0 | 4.6 | Do. |
| *P. k. fuscatus.* | | | | | | | | | | | |
| B. E. A.: Lake Naivasha | 162108 | ...do | 35 | 13.6 | 12.3 | 8.6 | 7.2 | 5.1 | 9.8 | 4.9 | Moderately worn. |
| *P. rüppelli.* | | | | | | | | | | | |
| Sudan: Khartoum | 164964 | Female | ..... | 13.1 | 12.7 | ..... | 6.8 | 4.8 | 9.1 | 4.6 | Moderately worn. |
| Do | 164965 | ...do | ..... | 13.1 | 11.8 | 8.3 | 6.8 | 4.9 | 8.9 | 4.5 | Do. |
| Do | 164966 | ...do | ..... | 13.3 | 12.3 | 8.3 | 6.9 | 4.8 | 9.2 | 4.5 | Considerably worn. |

[1] Type.

### Genus EPTESICUS Rafinesque.

1820. *Eptesicus* Rafinesque, Ann. Nat., vol. 1, p. 2. (*E. fuscus.*)

All the smaller bats of this genus that have definitely been determined from the region are included in the collection.

#### EPTESICUS PHASMA Allen.

1893. *Vesperugo* (*Vesperus*) *rendalli* True, Proc. U. S. Nat. Mus., vol. 16, p. 602. (Not of Thomas.)

1911. *Eptesicus phasma* G. M. Allen, Bull. Mus. Comp. Zool., vol. 54, p. 327. December. (Meru River, British East Africa; type in Mus. Comp. Zool., Harvard.)

*Specimens.*—Fourteen, as follows:

Uganda: Gondokoro, 1 (Loring).

British East Africa: Archer's Post, Northern Guaso Nyiro, 1 (Heller); Lakiundu River, 11, including 7 in alcohol (Heller); Tana River, 1 in alcohol (Chanler).

The specimen from Uganda is slightly darker in color than the specimens from the type region in British East Africa.

#### EPTESICUS TENUIPINNIS (Peters).

1872. *Vesperus tenuipinnis* Peters, Mon.-ber. K. Akad. Wiss. Berlin, p. 263. (Guinea.)

*Specimen.*—One in alcohol, as follows:

Lado: Rhino Camp (Mearns).

#### EPTESICUS CAPENSIS SOMALICUS (Thomas).

1901. *Vespertilio minutus somalicus* Thomas, Ann. and Mag. Nat. Hist., ser. 7, vol. 8, p. 32. July. (Hargaisa, British Somali; type in British Museum.)

*Specimens.*—Six, as follows:

British East Africa: Archer's Post, Northern Guaso Nyiro, 2 (Heller); Quoy Water, Marsabit Road, 1 (Heller); Southern Guaso Nyiro, 3, including 2 in alcohol (Loring, Mearns).

Specimens from the Southern Guaso Nyiro average somewhat larger than those from north of Kenia. They may be tending toward *Eptesicus capensis gracilior* of Zululand.

#### EPTESICUS UGANDÆ Hollister.

Plate 10, figs. 17, 18.

1916. *Eptesicus ugandæ* Hollister, Smithsonian Misc. Coll., vol. 66, No. 1, p. 3. February 10. (Ledgus, Uganda; type in U. S. Nat. Mus.)

*Specimens.*—Six, in alcohol, as follows:

Uganda: Kiriba Village, 10 miles south of Gondokoro, 3 (Heller); Ledgus, 3 (Loring).

EPTESICUS GRANDIDIERI (Dobson).

1876. *Vesperugo* (*Vesperus*) *grandidieri* DOBSON, Ann. Nat. Hist., ser. 4, vol. 18, p. 500. (Zanzibar; type in Paris Museum.)

*Specimen*: One, in alcohol, from—

BRITISH EAST AFRICA: Southern Guaso Nyiro River (Mearns).

This specimen agrees in every detail with Dobson's description of *E. grandidieri*, except that the hair extends thinly over the greater part of the anterior half of the interfemoral membrane. In the original account, it is stated that the fur "scarcely" extends upon the "membranes." The species is readily distinguished from the other small brown forms of *Eptesicus* known in East Africa by the distinctly bicuspidate upper inner incisors and the great length of the outer upper incisors, which reach nearly to the tip of the outer cusp of the inner incisor.

Genus NYCTICEIUS Rafinesque.

1819. *Nycticeius* RAFINESQUE, Journ. Phys., vol. 88, p. 417. June. (*N. humeralis.*)

1875. *Scoteinus* DOBSON, Proc. Zool. Soc. London, p. 371. (*N. emarginatus.*)

The old world species of bats usually placed in the genus *Scoteinus* do not seem to differ generically from the American species of *Nycticeius*.

NYCTICEIUS AFRICANUS Allen.

1911. *Nycticeius africanus* G. M. ALLEN, Bull. Mus. Comp. Zool., vol. 54, p. 328. December. (Meru River, British East Africa; type in Mus. Comp. Zool., Harvard.)

*Specimens*.—Fifteen, from localities as follows:

BRITISH EAST AFRICA: Archer's Post, 2 in alcohol (Heller); Kara River, Marsabit Road, 4 (Heller); Lakiundu River, 5, including 3 in alcohol (Heller); Mount Lololokwi, 3, including 1 in alcohol (Heller); Quoy, Marsabit Road, 1 (Heller).

This species seems closely related to *Nycticeius schlieffeni* Peters and should, perhaps, be treated as a subspecies of that form.

Genus SCOTŒCUS Thomas.

1901. *Scotœcus* THOMAS, Ann. and Mag. Nat. Hist., ser. 7, vol. 7, p. 263. March. (*S. albofuscus.*)

This genus is closely related to *Nycticeius* and even more closely to the American genus *Nycteris*. The resemblance of the skull to the skull of *Nycteris borealis* is very striking, and the presence of the small upper premolar in a large per cent of specimens leaves the genus separable from *Nycteris* only by the unfurred interfemoral membrane.

SCOTŒCUS HINDEI Thomas.

1901. *Scotœcus hindei* Thomas, Ann. and Mag. Nat. Hist., ser. 7, vol. 7, p. 264. (Kitui, British East Africa; type in British Museum.)

*Specimens.*—Seven, from localities as follows:

British East Africa: Archer's Post, 4, including 1 in alcohol (Heller); Lakiundu River, 2, including 1 in alcohol (Heller); Northern Guaso Nyiro, 1 odd skull (Heller).

Out of five skulls of this species in the collection four have the small spike-like upper premolar as described by Wroughton [1] and by G. M. Allen.[2] The normal dentition of the species would seem to include two upper premolars. In the skull in the United States National Museum collection which lacks the small premolar, the tiny alveolus can be seen on one side with a strong glass.

SCOTŒCUS ALBIGULA Thomas.

1901. *Scotœcus albigula* Thomas, Ann. and Mag. Nat. Hist., ser. 8, vol. 4, p. 544. (Kirui, Mt. Elgon, British East Africa; type in British Museum.)

*Specimens.*—Two in alcohol, as follows:

Uganda: Kiriba (Heller).

The skull of one of these specimens has been removed and exhibits the small upper premolars as described by Thomas in the type.

Genus SCOTOPHILUS Leach.

1821. *Scotophilus* Leach, Trans. Linn. Soc. London, vol. 13, p. 69. (*S. kuhlii.*)
1831. *Pachyotus* Gray, Zool. Misc., p. 38. (*S. kuhlii.*)

The widely ranging bat *Scotophilus nigrita* (Schreber) is represented in the collection by the common subspecies of British East Africa.

SCOTOPHILUS NIGRITA COLIAS Thomas.

1904. *Scotophilus nigrita colias* Thomas, Ann. and Mag. Nat. Hist., ser. 7, vol. 13, p. 207. March. (Fort Hall, British East Africa; type in British Museum.)
1910. *Scotophilus nigrita colias* Roosevelt, African Game Trails, Amer. ed., p. 474; London ed., p. 486.
1910. *Scotophilus nigrita colias* Roosevelt, African Game Trails, Amer. ed., p. 480; London ed., p. 491.

*Specimens.*—Thirteen, from the following localities:

British East Africa: Archer's Post, 1 (Heller); Lakiundu River, 1 (Heller); Merelle River, Marsabit Road, 2, including 1 in alcohol (Heller); Nairobi, 9, including 7 in alcohol (Mearns, Heller, Loring).

Common at Nairobi; flying among the tree tops in the evening. Has the same flight as our big brown bat—*Vespertilio fuscus.* (Roosevelt, Afr. Game Trails, p. 480.)

[1] Mem. Proc. Manchester Lit. Philos. Soc., pt. 2, No. 5, p. 4 1907.
[2] Bull. Mus. Comp. Zool., vol. 54, No. 9, p. 330. 1911.

### Genus MINIOPTERUS Bonaparte.

1837. *Miniopterus* Bonaparte, Icon. Fauna Italica, vol. 1, fasc. 20, under *V. emarginatus*. (*M. schreibersii*.)

The African forms of this genus of bats are badly in need of careful revision. The single species included in our collection from East Africa is closely related to *M. schreibersii* of Europe.

#### MINIOPTERUS NATALENSIS ARENARIUS Heller.

Plate 10, figs. 19, 20.

1912. *Miniopterus natalensis arenarius* Heller, Smithsonian Misc. Coll., vol. 60, No. 12, p. 2. November 4. (Nyuki River, Northern Guaso Nyiro, British East Africa; type in U. S. Nat. Mus.)

*Specimens.*—Thirteen, as follows:

British East Africa: Lake Naivasha, 8, including 6 in alcohol (Heller, Mearns, Loring); Northern Guaso Nyiro River, 1 (Heller); Ngare Nyuki, 2, including 1 in alcohol (Heller); Ulukenia Hills, 2 in alcohol (Loring).

The Naivasha Lake specimens seem to be inseparable from those from the type region. The form is very close to true *natalensis*, but is slightly darker in color (not paler, as stated in the original description). The type-specimen was captured, with specimens of *Rhinolophus*, in a rock cave.

## Family MOLOSSIDÆ.

### Genus CHÆREPHON Dobson.

1874. *Chærephon* Dobson, Journ. Asiatic Soc. Bengal, vol. 43, pt. 2, p. 144. (*C. johorensis*.)

The species of this genus of free-tailed bats included in our East African collections are all members of the "*pumilus* group." The exact status of these and other forms described within the group is still uncertain, as the variation in pattern and extent of the white markings, which have been used as specific characters, seem to be to a considerable degree individual. The position and shape of the small upper premolar is likewise subject to great variation in a series from one locality.

For tables of measurements of specimens see pages 96-97.

#### CHÆREPHON PUMILUS PUMILUS (Cretzschmar).

1826. *Dysopes pumilus* Cretzschmar, Rüpp. Atlas Zool., vol. 1, p. 69. (Massaua, Eritrea.)

*Specimens.*—Twenty-three, from localities as follows:

Eritrea: Massaua, 1 in alcohol (Genoa Mus.); Saaita, 4 in alcohol (Raggazzi).

Sudan: Mongalla, 8 in alcohol (Heller).

Uganda: Gondokoro, 10, including 7 in alcohol (Loring).

*Measurements of specimens of Chaerephon.*

| Form and locality. | No. | Sex. | Forearm. | Skull: Condylo-basal length. | Zygo-matic breadth. | Inter-orbital constric-tion. | Mastoid breadth. | Mandible. | Maxillary tooth row, in-cluding canine. | Entire lower tooth row. | Observations. |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *C. p. pumilus.* | | | | | | | | | | | |
| Eritrea: | | | | | | | | | | | |
| Massaua [1] | 18546 | Female.. | 37 | 14.8 | 10.0 | 3.6 | 9.0 | 11.2 | 6.1 | 6.8 | Teeth moderately worn. |
| Saaita | 143166 | Male.... | 38 | 15.4 | 10.4 | 3.5 | 9.2 | 11.8 | 6.2 | 7.0 | Do. |
| Do | 143167 | ...do..... | 37 | 15.8 | 10.7 | 3.7 | 9.2 | 11.6 | 6.2 | 6.7 | Do. |
| Do | 143168 | ...do..... | 35 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | Young; in alcohol. |
| Do | 143169 | Female.. | 39 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | In alcohol. |
| Sudan: Mongalla | 166675 | ...do..... | 36 | ..... | ..... | ..... | 9.5 | 11.0 | 6.0 | 6.4 | Teeth moderately worn. |
| Do | 166676 | ...do..... | 37 | 14.7 | 9.8 | ..... | 9.5 | 11.1 | 5.9 | 6.2 | Do. |
| Do | 166677 | ...do..... | 37 | 14.6 | 10.0 | 4.0 | 9.8 | 10.8 | 5.9 | 6.3 | Do. |
| Do | 166678 | ...do..... | 36 | ..... | 9.9 | 3.7 | ..... | 10.7 | 5.8 | 6.5 | Do. |
| Uganda: Gondokoro | 164972 | Male..... | ..... | 14.2 | 9.3 | 3.6 | 8.8 | 10.2 | 5.6 | 6.4 | Teeth unworn. |
| Do | 166679 | ...do..... | 36 | ..... | ..... | ..... | ..... | 11.0 | ..... | 6.5 | Teeth moderately worn. |
| Do | 166683 | ...do..... | 36 | 14.8 | ..... | 3.7 | 9.8 | 10.5 | 5.9 | 6.3 | Do. |
| Do | 166684 | ...do..... | 36 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | In alcohol. |
| Do | 166687 | ...do..... | 38 | 15.2 | 10.2 | 3.7 | 9.4 | 11.2 | 6.1 | 6.8 | Teeth moderately worn. |
| Do | 164970 | Female.. | 36 | ..... | ..... | ..... | ..... | 10.8 | 5.7 | 6.5 | Teeth little worn. |
| Do | 164971 | ...do..... | 36 | 14.8 | 9.8 | 3.6 | 9.4 | 10.8 | 5.8 | 6.4 | Do. |
| Do | 166682 | ...do..... | 37 | 14.6 | ..... | 3.8 | 9.4 | 11.2 | ..... | 6.8 | Teeth moderately worn. |
| Do | 166685 | ...do..... | 36 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | In alcohol. |
| Do | 166686 | ...do..... | 35 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | Do. |
| *C. p. naivashæ.* | | | | | | | | | | | |
| B. E. A.: Naivasha | [2] 166658 | Male... | 42 | 16.0 | 10.8 | 4.0 | 9.9 | 11.7 | 6.3 | 7.3 | Teeth moderately worn. |
| Do | 166659 | ...do..... | 41 | 18.7 | 10.8 | 3.8 | 9.8 | 11.7 | 6.2 | 7.3 | Do. |
| Do | 166664 | ...do..... | 39 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | In alcohol. |
| Do | 166665 | ...do..... | 40 | ..... | ..... | ..... | ..... | ..... | ..... | ..... | Do. |
| Do | 166666 | ...do..... | 41 | 15.8 | 10.3 | 3.9 | 10.0 | 11.7 | 6.0 | 7.0 | Teeth little worn. |
| Do | 162101 | Female.. | 40 | 15.6 | 9.8 | 4.0 | ..... | 11.8 | 6.2 | 7.1 | Teeth moderately worn. |
| Do | 162102 | ...do..... | 40 | 15.6 | 10.3 | 3.8 | 9.6 | 11.2 | 6.2 | 7.0 | Teeth little worn. |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Do | 162103 | ...do..... | 41 | 15.0 | 9.9 | 3.8 | 9.5 | 11.6 | 5.9 | 6.9 | Teeth moderately worn. |
| Do | 166657 | ...do..... | 40 | | | | | | | | In alcohol. |
| Do | 166660 | ...do..... | 39 | | | | | | | | Do. |
| Do | 166661 | ...do..... | 42 | 15.8 | 10.3 | 4.0 | 9.8 | 11.9 | 6.1 | 6.9 | Teeth moderately worn. |
| Do | 166662 | ...do..... | 40 | | | | | | | | In alcohol. |
| Do | 166663 | ...do..... | 39 | | | | | | | | Do. |
| Do | 166667 | ...do..... | 40 | | | | | | | | Do. |
| Do | 166668 | ...do..... | 40 | | | | | | | | Do. |
| *C. hindei.* | | | | | | | | | | | |
| B. E. A.: | | | | | | | | | | | |
| Fort Hall | 164018 | Male.... | 39 | 16.9 | 11.0 | 3.9 | 10.2 | 12.5 | 7.0 | 7.5 | Teeth moderately worn. |
| Do | 164019 | ...do..... | 40 | 17.0 | 10.9 | 4.0 | 10.0 | 13.1 | 6.9 | 7.3 | Do. |
| Do | 164020 | ...do..... | 37 | 15.9 | 10.8 | 3.7 | 9.8 | 12.4 | 6.6 | 7.4 | Do. |
| Do | 166689 | ...do..... | 38 | | | | | | | | In alcohol. |
| Do | 166691 | ...do..... | 38 | | | | | | | | Do. |
| Do | 164017 | Female.. | 40 | 16.8 | 10.4 | 3.6 | 9.8 | 11.8 | 6.5 | 7.5 | Teeth moderately worn. |
| Do | 166669 | ...do..... | 39 | | | | | | | | In alcohol. |
| Do | 166690 | ...do..... | 39 | | | | | | | | Do. |
| Mtoto Andei | 181467 | Male.... | 38 | 16.8 | 11.1 | 3.8 | | 12.5 | 6.6 | 7.5 | Teeth little worn. |
| Do | 181463 | Female.. | 37 | 16.2 | 11.5 | 3.6 | 9.8 | 11.8 | 6.4 | 7.3 | Teeth moderately worn. |
| Do | 181464 | ...do..... | | 15.5 | 11.5 | 3.7 | 9.8 | 11.2 | 6.5 | 7.1 | Teeth little worn. |
| Do | 181465 | ...do..... | 38 | 16.3 | 10.6 | 3.6 | 9.8 | 11.8 | 6.6 | 7.5 | Do. |
| Do | 181466 | ...do..... | 38 | 16.2 | 10.8 | 3.6 | 9.9 | 12.2 | 6.6 | 7.5 | Do. |
| *C. limbatus.* | | | | | | | | | | | |
| Zanzibar | 17899 | Male.... | 38 | | | | | | | | In alcohol. |
| Do | 174673 | ...do..... | 36 | | | | | | | | Do. |
| Do | 174672 | Female.. | 37 | 16.2 | 10.8 | 3.8 | 9.8 | 12.2 | 6.2 | 7.1 | Teeth moderately worn. |
| Do | 174674 | ...do..... | 38 | 15.7 | 10.4 | 3.6 | 9.4 | 11.7 | 6.4 | 7.3 | Do. |
| Do | 174675 | ...do..... | 38 | 15.8 | 10.4 | 3.6 | 9.6 | 12.0 | 6.3 | 7.2 | Do. |
| Do | 174676 | ...do..... | 39 | | | | | | | | In alcohol. |
| Do | 174677 | ...do..... | 36 | | | | | | | | Do. |
| *C. emini.* | | | | | | | | | | | |
| Uganda: Gondokoro | 166688 | ...do..... | 42 | 17.2 | 11.2 | 4.1 | 10.8 | 12.7 | 6.9 | 7.9 | Teeth little worn. |

[1] Type locality.

[2] Type.

CHÆREPHON PUMILUS NAIVASHÆ Hollister.

Plate 11, figs. 1, 2.

1910. *Nyctinomus hindei* ROOSEVELT, African Game Trails, Amer. ed., p. 480; London ed., p. 491. (Part, specimens from Naivasha; not of Thomas.)

1916. *Chærephon pumilus naivashæ* HOLLISTER, Smithsonian Misc. Coll., vol. 66, No. 1, p. 4. February 10. (Naivasha Station, British East Africa; type in U. S. Nat. Mus.)

*Specimens.*—Fifteen, including 12 in alcohol, as follows:

BRITISH EAST AFRICA: Naivasha Station (Loring).

This subspecies is larger and darker than true *pumilus* of Eritrea and Sudan, and has a longer forearm. One skin is a rich reddish brown, quite different from the ordinary blackish specimens.

CHÆREPHON HINDEI (Thomas).

1904. *Nyctinomus hindei* THOMAS, Ann. and Mag. Nat. Hist., ser. 7, vol. 13, p. 210. March. (Fort Hall, British East Africa; type in British Museum.)

1910. *Nyctinomus hindei* ROOSEVELT, African Game Trails, Amer. ed., p. 480; London ed., p. 491. (Part, reference to Athi Plains.)

1917. C[*hærephon*] *hindei* ALLEN, Bull. Amer. Mus. Nat. Hist., vol. 37, p. 457, September 29.

*Specimens.*—Twenty-five, from the following localities:

BRITISH EAST AFRICA: Fort Hall, 8, including 4 in alcohol (Loring); Mtoto Andei, 17, including 12 in alcohol (Heller).

Three out of four skins from the Fort Hall series have the light-colored wing membranes as described by Thomas of the type. One specimen has dark blackish-brown wing membranes, but is in all other respects exactly like the white-winged specimens. In the Mtoto Andei series there is likewise a single specimen with dark wings.

CHÆREPHON LIMBATUS (Peters).

1852. *Dysopes limbatus* PETERS, Reise Mossambique, vol. 1, p. 56, pl. 14. (Mosambique, Portuguese East Africa; cotypes in Berlin Museum.)

*Specimens.*—Seven, as follows:

ZANZIBAR: Zanzibar, 7 in alcohol (Weddell, Salmin).

There is great variation in the extent of the white on the underparts in these seven specimens from Zanzibar. In one specimen the white covers the entire underparts except for a small broken band of dark across the upper chest; in another it is restricted to the center of the lower breast and the belly, like the figure in Peters's plate; and there are specimens between these two extremes of coloration. It would seem that the extent or pattern of the white below is of very little use in distinguishing forms of these bats.

CHÆREPHON EMINI (de Winton).

1901. *Nyctinomus emini* DE WINTON, Ann. and Mag. Nat. Hist., ser. 7, vol. 7, p. 40. (Usambiro,[1] German East Africa; type in British Museum.)

[1] In the original description the type locality is given as "Mosambiro"; the correction was made by Thomas, Ann. and Mag. Nat. Hist., ser. 7, vol. 13, p. 210, March, 1914.

*Specimen.*—One in alcohol, as follows:

UGANDA: Gondokoro (Loring).

Externally this specimen agrees in all details with the description of *Chærephon emini*. The skull is peculiar for a *Chærephon*, however, having a very flat braincase and incompletely ossified premaxillæ, approaching in these characters certain species of *Nyctinomus*. As no description of the skull, with measurements, of *Chærephon emini* has ever been published, I wrote to Mr. Oldfield Thomas asking for information regarding it, sending him a rather complete description of this specimen from Gondokoro. His reply, in part, is as follows:

> The type skull of *Chærephon emini* is unfortunately much smashed, consisting of but little more than the muzzle, which accounts for the absence of published measurements. What there is of it, however, agrees so nearly with what you say of yours that it seems probable that the two are the same, as you suppose. The color of the fur is quite the same and there is but little difference in the measurements. The median ossification between the premaxillæ is very imperfect, thin, and with vacuities in it, so that one might expect to find examples without a median connection at all. The maxillary tooth row is 7.1 mm. Incisors and small premolar as you describe. Owing to the imperfection of the skull, the shape of the braincase is not determinable.

It seems probable then that this specimen from Gondokoro is *emini*, and that the skull of that species is quite *Nyctinomus*-like, though with less emargination of the anterior palate than is usual in *Nyctinomus*. The generic separation of *Chærephon* is perhaps questionable.

A more complete description of the Gondokoro specimen, an adult female in alcohol, with skull removed, number 166688, U. S. N. M., follows: Nose pad large, protruding, and glandular, with distinct leaflike, serrated upper margin and median dividing ridge; lips deeply furrowed by six-seven vertical wrinkles on each side. Ears large, subquadrate, connected by the inner margins and a wide supplemental fold, which forms a deep sac with large posterior entrance, extending under marginal connection in the form of a glandular protuberance to the base of the hard, triangular nose pad where there are four small, circular, wartlike, stiffly bristled spots, apparently glandular openings. Anterior side of ears slightly convex, the margin folded backward nearly to first tip corner; posterior, or rather upper, margin concave anteriorly and convex posteriorly; keel conspicuous, broad basally and gently tapering toward center of anterior margin of ear; antitragus large, rounded; tragus small, subquadrate, the anterior and lower sides slightly emarginate; throat with a small bristly glandular spot set in center of large bare space; wing from front side of lower half of tibia; tail free for about three-fifths its length; fur extending on wing above to line from middle of humerus to middle of femur, and only slightly on to base of interfemoral membrane and inner edge of antebrachial membrane; beneath, the membranes are virtually naked, except for a few white hairs on antebrachial membranes, a strip of white hair crossing

wing parallel with and close to body, and scattering white hairs on interfemoral membrane. Thumb pad comparatively small. Feet large, the toes with numerous long hairs. Color (from alcoholic specimen) above, uniform dark brown, the membranes paler with narrow strip of buff along lower edge of wings near foot; below slightly lighter than back, the hairs with lighter bases and lighter tips; middle of belly whitish; wing membranes beneath whitish near body and blending into pale brown about middle of wing; interfemoral membrane beneath whitish or pale buffy. Skull flat, with narrow interorbital region and wide, flat braincase; emargination of palate between premaxillæ comparatively very slight, narrow, and reaching backward to plane of center of canines. Upper incisors large, the inner sides nearly parallel; small upper premolar comparatively large, in middle of line of row, and considerably higher than cingulum of large premolar; molars robust; lower incisors crowded, the outer ones partially hidden behind the middle pair which have broad bilobed crowns. Measurements: Head and body, 64; tail, 50; forearm, 42; third finger metacarpal, 40.3; first phalanx, 17.6, second phalanx, 16.5; fourth metacarpal, 38.9; fifth metacarpal, 24.5; tibia, 12; foot, with claws, 8.2. Skull: Greatest length, 18.3; condylobasal length, 17.2; median basal length, 13.8; zygomatic breadth, 11.2; postorbital constriction, 4.1; mastoid breadth, 10.8; depth of braincase, 5.5; mandible, 12.7; maxillary tooth row, including canine, 6.9; greatest breadth across maxillary rows, 8.2; greatest breadth across upper canines, 4.9; width of first upper molar, 2.2; entire lower tooth row, 7.9.

### Genus NYCTINOMUS Geoffroy.

1813. *Nyctinomus* Geoffroy, Desc. l'Égypte, vol. 2, p. 114. (*N. ægyptiacus.*)
1814. *Tadarida* Rafinesque, Précis Découv. Somiol., p. 55. (*N. teniotis.*)
1816. *Nyctinomus* Oken, Lehrb. Nat., 3ter Theil, 2te Abth., p. 924. (*N. ægyptiacus.*)
1914. *Tadarida* Lyon, Proc. Biol. Soc. Washington, vol. 27, p. 217.[1]

The free-tailed bats of the restricted genus *Nyctinomus* are apparently rare in East Africa, as they are not often obtained by collectors. A single species was obtained by the Smithsonian African Expedition.

#### NYCTINOMUS ÆGYPTIACUS Geoffroy.

1813. *Nyctinomus ægyptiacus* Geoffroy, Desc. l'Égypte, vol. 2, p. 128. (Egypt; type in Paris Museum.)

*Specimen.*—One in alcohol as follows:

British East Africa: Juja Farm (Loring).

Measurements of this important specimen are as follows: Forearm, 50 millimeters; skull, greatest length, 20.5; condylobasal length, 19.5; zygomatic breadth, 12.2; mastoid breadth, 11.1; depth of braincase,

[1] See remarks, p. 71.

6.1; postorbital constriction, 4.8; mandible, 15; upper tooth row, including canine, 7.7; greatest breadth across last upper molars, 8.4; entire lower tooth row, 9.3. The specimen was captured May 18, 1909.

# Order CARNIVORA.

## Family CANIDÆ.

### Genus THOS Oken.

1816. *Thos* Oken, Lehrb. Nat., 3ter Theil, 2te Abth., p. 1037. (*T. aureus.*)
1837. *Vulpicanis* Blainville, Ann. Sci. Nat., Paris, ser. 2, vol. 8, p. 279. (*T. aureus.*)
1841. *Oxygoüs* Hodgson, Calcutta Journ. Nat. Hist., vol. 2, p. 213. July. (*T. aureus indicus.*)
1869. *Dicba* Gray, Cat. Carn. Mamm. Brit. Mus., p. 180. (*T. aureus anthus.*)
1906. *Lupulella* Hilzheimer, Zool. Beob., vol. 47, p. 363. December. (*T. mesomelas.*)
1906. *Schaeffia* Hilzheimer, Zool. Beob., vol. 47, p. 364. December. (*T. adustus.*)
1906. *Alopecdon* Hilzheimer, Zool. Beob., vol. 47, p. 365. December. (*C[anis] thooides* Hilzheimer="*C. anthus* Cretzschmar, not of Cuvier.")
1914. *Thos* Heller, Smithsonian Misc. Coll., vol. 63, No. 7, p. 1. June 24.

Concerning the jackals of this region Heller has written as follows:

East equatorial Africa or rather Northeast Africa generally is supplied with more species of jackals than any other region. Three distinct species are found living together on the same plains over most of the territory of British East Africa. The most distinct of the three species in coloration is the black-backed or *T. mesomelas*, which has the black of the back sharply marked off from the bright rufous of the sides. The Indian species, *T. aureus*, which here reaches its southern limit in Africa, approaches *mesomelas* closely in shape of skull and the large size of its reddish ears, but differs by the broken character of its black dorsal area which merges indefinitely into the color of the sides. The best marked species of the three in skull characters is the side-striped jackal or *T. adustus*, which has a long slender snout and very long *Vulpes*-like canine teeth. In body coloration, however, it is not always easily distinguishable from the Indian, but it may be recognized with certainty by its small dark-colored ears and the presence of a more or less well-marked white tail tip. (Heller, Smiths. Misc. Coll., vol. 63, No. 7, pp. 1–2.)

For measurements of specimens of jackals see tables, pages 104-108.

#### THOS ADUSTUS BWEHA Heller.

Plates 12, 13.

1914. *Thos adustus bweha* Heller, Smithsonian Misc. Coll., vol. 63, No. 7, p. 3. June 24. (Kisumu, British East Africa; type in U. S. Nat. Mus.)

*Specimens.*—Six, from localities as follows:

British East Africa: Guas Ngishu Plateau, 2 (White); Kakumega, 1 (Heller); Kisumu, 3 (Heller).

The Swahili name for the jackal and the one commonly adopted by the interior tribes now in touch with European civilization is *bweha*. Distinctive names for the three species occurring together throughout the country do not appear to be in use among any of the tribes (Heller).

#### THOS ADUSTUS NOTATUS Heller.

Plates 14, 15.

1914. *Thos adustus notatus* Heller, Smithsonian Misc. Coll., vol. 63, No. 7, p. 4. June 24. (Loita Plains, British East Africa; type in U. S. Nat. Mus.)

*Specimens.*—Six, as follows:

British East Africa: Loita Plains, Sotik, 2 (Rainey, Heller); Nairobi, 2 odd skulls (Mearns); Telek River, Sotik, 1 (Heller).

German East Africa: Ikoma, 1 skull (E. Clark).

The material representing this race of the side-striped jackal is rather unsatisfactory. The subspecies is not a very well-marked one, and I will not be surprised if, when larger series for examination are available, it is found impossible to recognize more than one race of *adustus* in British East Africa. Two of the three skins are very conspicuous in their white markings below; but the third, a youngish female, is indistinguishable from specimens of *Thos adustus bwcha*. This color difference is not sexual, as suggested by Heller,[1] because the second Loita Plains specimen, in all respects colored like the type male, proves to be a female, and not an adult male, as stated by Heller.

#### THOS AUREUS VARIEGATUS (Cretzschmar).

1826. *Canis variegatus* Cretzschmar, Rüpp. Atlas. Zool., vol. 1, p. 31. (Nubia; type in Frankfort Museum.)

*Specimen.*—One, from—

Eritrea: Habesch (Schrader).

#### THOS AUREUS BEA Heller.

Plates 16, 17.

1910. *Canis variegatus* Roosevelt, African Game Trails, Amer. ed., p. 473. London ed., p. 485. (Not of Cretzschmar.)

1914. *Thos aureus bea* Heller, Smithsonian Misc. Coll., vol. 63, No. 7, p. 5; June 24. (Loita Plains, British East Africa; type in U. S. Nat. Mus.)

*Specimens.*—Eleven, from localities as follows:

British East Africa: Kasorongai River, 2 (Mearns, Loring); Laikipia Plains, 2 (K. Roosevelt, Heller); Lake Naivasha, 1 (Heller); Loita Plains, Sotik, 2 (Rainey, Heller); Naivasha Station, 1 odd skull (Loring); Oui, 1 (Loring); Sotik Road, Sotik, 1 (Rainey); Suswa Plain, 1 (Rainey).

This subspecies is readily distinguishable from the more northern *variegatus* by its much smaller size. It is the most southern race of *aureus* and the only one known to extend south of the Equator.

[1] Smithsonian Misc. Coll., vol. 63, No. 7, p. 4. June 24, 1914.

THOS MESOMELAS ELGONÆ Heller.

Plates 18, 19.

1914. *Thos mesomelas elgonae* HELLER, Smithsonian Misc. Coll., vol. 63, No. 7, p. 6. June 24. (Guas Ngishu Plateau, British East Africa; type in U. S. Nat. Mus.)

*Specimens.*—Ten, as follows:

BRITISH EAST AFRICA: Guas Ngishu Plateau (White, Heller, K. Roosevelt).

THOS MESOMELAS MCMILLANI Heller.

Plates 20, 21.

1892. *Canis mesomelas* TRUE, Proc. U. S. Nat. Mus., vol. 15, p. 455. (Taveta; not of Schreber.)

1914. *Thos mesomelas mcmillani* HELLER, Smithsonian Misc. Coll., vol. 63, No. 7, p. 6. June 24. (Mtoto Andei, British East Africa; type in U. S. Nat. Mus.)

*Specimens.*—Thirty-nine, from the following localities:

BRITISH EAST AFRICA: Archer's Post, 4 (Heller); Kabalolot Hill, Sotik, 3 (Heller); Koya Water, Marsabit Road, 2 (Heller); Lakiundu River, 6 (Rainey, Heller); Lime Springs, Sotik, 3 (Rainey); Loita Plains, 1 (Heller); Merelle Water, 7 (Heller); Mtoto Andei, 1 (Heller); Southern Guaso Nyiro River, 4 (Mearns, Heller); Taveta, 1 (Abbott); Telek River, Sotik, 5 (Heller, Rainey); Ulukenia Hills, 1 (Loring).

GERMAN EAST AFRICA: Mount Kilimanjaro, 1, mounted (Abbott.)

This race is confined to the coast drainage and the lower parts of the Rift Valley and is the only jackal which is found in the low desert nyika country (Heller).

Genus LYCAON Gray.

1827. *Lycaon* (BROOKS) GRAY, Griffith's Cuvier, vol. 5, p. 151. (*L. pictus.*)

1829. *Cynhyæna* CUVIER, Dict. Sci. Nat., vol. 59, p. 454. (*L. pictus.*)

1842. *Hyenoides* BOITARD, Jardin Plantes, p. 163. (*L. pictus.*)

1842. *Kynos* RÜPPELL, Mus. Senckenberg, vol. 3, p. 163. (*L. pictus.*)

The hunting dog, the largest of the African Canidæ, is related closely to the genus *Cuon* of Asia, but is distinguished by having only four toes on each foot and by the presence of an additional lower molar tooth. A subspecies described from British Somaliland, *Lycaon pictus somalicus* Thomas, is not represented in our collection.

I have seen a reference to a paper by Dr. Paul Matschie,[1] in which 26 new forms of *Lycaon* are said to be described. This publication is not available in America since the beginning of the war in Europe.[2]

[1] Mitteilungen über Hyänenhunde, Sitz.-Ber. Ges. nat. Freunde Berlin, 1915, pp. 309-391.

[2] It is possible that other papers dealing with groups included in this report and published by German authors since the beginning of the war have not been seen, as the receipt of German scientific publications has been for the past three years very irregular or even entirely discontinued.

*Measurements of skulls of Thos from British East Africa.*

| Form and locality. | No. | Sex. | Condylo-basal length. | Zygomatic breadth | Mastoid breadth. | Post-orbital constriction. | Inter-orbital constriction. | Rostral breadth over canine. | Lachrymal foramen to alveolar point. | Median length nasals. | Mandible. | Maxillary tooth row. | Lower molar-premolar row. | Observations. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *T. adustus bweha.* | | | | | | | | | | | | | | |
| Guas Ngishu Plateau | 173019 | Male | 155 | 85 | 53 | 31 | 27.4 | 27.0 | 67 | 63 | 121 | 68 | 61 | Basal suture closed. |
| Do | 173016 | Female | 142 | 75 | 49 | 27 | 25.7 | 24.4 | 61 | 55 | 110 | 64 | 57 | Do. |
| Kakumega | 182384 | do | 142 | 71 | 49 | 30 | 21.7 | 24.8 | 61 | 50 | 110 | 66 | 62 | Basal suture open. |
| Kisumu | [1] 182342 | Male | 152 | 82 | 49 | 30 | 27.2 | 27.0 | 67 | 53 | 120 | 69 | 60 | Basal suture closed. |
| Do | 182343 | do | 153 | 84 | 50 | 31 | 27.5 | 27.1 | 66 | 59 | 120 | 69 | 61 | Do. |
| Do | 182348 | do | 153 | 83 | 51 | 32 | 27.9 | 27.6 | 64 | 58 | 119 | 68 | 61 | Do. |
| *T. adustus notatus.* | | | | | | | | | | | | | | |
| Nairobi | 162137 | Male | 156 | 80 | 50 | 28 | 25.7 | 27.2 | 68 | 58 | 121 | ..... | 63 | Basal suture closed. |
| Loita Plains | [1] 181486 | do | 152 | 79 | 51 | 31 | 26.7 | 27.8 | 66 | 53 | 120 | 71 | 66 | Basal suture open. |
| Do | 181488 | Female | 145 | 81 | 49 | 31 | 28.0 | 24.5 | 64 | 51 | 112 | 67 | 62 | Basal suture closed. |
| Telek River | 181496 | do | 141 | 72 | 47 | 31 | 23.0 | 26.0 | 62 | 53 | 108 | 66 | 63 | Basal suture open. |
| *T. aureus bea.* | | | | | | | | | | | | | | |
| Loita Plains | 181501 | Male | 139 | 77 | 47 | 25 | 23.4 | 24.5 | 63 | 48 | 108 | 64 | 61 | Basal suture open. |
| Do | [1] 162901 | Female | 139 | 76 | 48 | 26 | 23.6 | 25.3 | 63 | 48 | 108 | 66 | 63 | Basal suture closed. |
| Naivasha | 162139 | Male | 145 | 78 | 51 | 31 | 26.2 | 25.2 | 65 | 50 | 111 | 66 | 63 | Do. |
| Do | 162905 | Female | 142 | 75 | 48 | 27 | 23.1 | 24.4 | 65 | 49 | 108 | 66 | 62 | Basal suture open. |
| Suswa Plains | 182007 | do | 139 | 77 | 48 | 27 | 25.4 | 24.6 | 63 | 47 | 108 | 64 | 61 | Basal suture closed. |
| Kasorongai River | 163293 | do | 144 | 80 | 50 | 30 | 26.3 | 25.2 | 63 | 47 | 109 | 65 | 60 | Do. |
| Do | 163301 | do | 145 | 79 | 50 | 27 | 26.5 | 24.8 | 64 | 47 | 112 | 64 | 62 | Do. |
| Oni | 163302 | do | 143 | 79 | 50 | 30 | 26.8 | 24.3 | 65 | 50 | 110 | 63 | 58 | Do. |
| Laikipia | 164750 | Male | 147 | 76 | 51 | 30 | 24.2 | 26.0 | 66 | 52 | 115 | 67 | 62 | Basal suture open. |
| Do | 164698 | Female | 141 | 80 | 48 | 29 | 25.1 | 23.9 | 61 | 43 | 109 | 64 | 60 | Basal suture closed. |
| *T. mesomelas elgonae.* | | | | | | | | | | | | | | |
| Guas Ngishu Plateau | [1] 164699 | Male | 140 | 84 | 50 | 31 | 28.4 | 24.0 | 58 | 43 | 109 | 64 | 59 | Basal suture closed. |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Do | 173015 | ..... | 144 | ..... | ..... | ..... | ..... | 24.6 | 62 | 44 | 110 | 65 | 59 | ..... |
| Do | 173017 | ..... | 143 | 88 | 53 | 34 | 29.6 | 26.0 | 62 | 43 | ..... | 65 | ..... | Basal suture closed. |
| Do | 173020 | ..... | 141 | 90 | 51 | ..... | 31.4 | 26.1 | 61 | 45 | 109 | 65 | 59 | Do. |
| Do | 173014 | ..... | 143 | 87 | 51 | 34 | 30.2 | 24.5 | 62 | 47 | 110 | 64 | 54 | Do. |
| Do | 173018 | ..... | 142 | 82 | 50 | 32 | 28.2 | 22.9 | 62 | ..... | 109 | 65 | 58 | Do. |
| Do | 164611 | Female. | 136 | 83 | 51 | 33 | 28.0 | 23.3 | 56 | 41 | 109 | 60 | 51 | Do. |
| Do | 164614 | ...do..... | 143 | 83 | 52 | 30 | 27.4 | 24.0 | 61 | 47 | 110 | 65 | 61 | Do. |
| Do | 164752 | ...do..... | 142 | 82 | 51 | 31 | 27.0 | 24.0 | 62 | 44 | 109 | 65 | 56 | Do. |
| *T. mesomelas mcmillani.* | | | | | | | | | | | | | | |
| Taveta | 18941 | ..... | 143 | 82 | 50 | 35 | 30.2 | 24.8 | 63 | 51 | 110 | 66 | 60 | Basal suture closed. |
| Mtoto Andei | [1] 181483 | Female. | 137 | 81 | 49 | 32 | 29.2 | 24.4 | 59 | 49 | 107 | 64 | 57 | Do. |
| Ulukenia Hills | 164546 | ..... | 143 | 83 | 52 | 33 | 33.0 | 26.4 | 63 | 54 | 112 | 66 | 61 | Do. |
| Loita Plains | 181503 | Female. | 140 | 82 | 50 | 34 | 28.2 | 25.9 | 61 | 45 | 109 | 63 | 60 | Do. |
| Lime Springs | 181490 | Male.... | 139 | 83 | 50 | 33 | 27.6 | 25.6 | 59 | 46 | 107 | 63 | 59 | Do. |
| Do | 181491 | ...do..... | 146 | 85 | 41 | 34 | 28.7 | 26.0 | 64 | 50 | 112 | 65 | 62 | Do. |
| Do | 181489 | Female. | 134 | 80 | 49 | 33 | 27.8 | 24.2 | 59 | 50 | 104 | 62 | 58 | Do. |
| Kabalolot Hill | 181493 | Male.... | 144 | 81 | 50 | 33 | 29.3 | 24.7 | 62 | 53 | 111 | 65 | 60 | Do. |
| Do | 181492 | Female. | 141 | 81 | 52 | 32 | 26.2 | 24.8 | 59 | 43 | 108 | 62 | 58 | Do. |
| Do | 181494 | ...do.... | 139 | 84 | 49 | 34 | 30.0 | 25.4 | 60 | 49 | 107 | 63 | 57 | Do. |
| Telek River | 181499 | Male.... | 144 | 85 | 53 | 31 | 28.8 | 25.3 | 63 | 53 | 113 | 66 | 61 | Do. |
| Do | 181497 | Female. | 137 | 83 | 50 | 34 | 27.7 | 24.2 | 59 | 48 | 105 | 62 | 58 | Do. |
| Do | 181498 | ...do..... | 143 | 84 | 54 | 31 | 26.1 | 25.6 | 63 | 47 | 112 | 66 | 61 | Do. |
| Do | 181500 | ...do..... | 143 | 81 | 52 | 31 | 26.3 | 25.0 | 61 | 57 | 110 | 63 | 60 | Do. |
| Do | 181501 | ...do..... | 148 | 84 | 52 | 31 | 27.1 | 25.6 | 63 | 51 | 114 | 65 | 60 | Do. |
| So. Guaso Nyiro | 162135 | Male.... | 153 | 87 | 55 | 34 | 29.0 | 26.7 | 66 | 54 | 116 | 69 | 64 | Do. |
| Do | 162903 | ...do..... | 143 | 83 | 51 | 32 | 29.7 | 24.7 | 63 | 47 | 111 | 65 | 60 | Do. |
| Do | 162136 | Female. | 149 | 83 | 51 | 32 | 27.4 | 25.5 | 64 | 49 | 113 | 68 | 63 | Do. |
| Do | 162902 | ...do..... | 139 | 78 | 50 | 35 | 27.8 | 24.1 | 62 | 46 | 107 | 63 | 60 | Basal suture open. |
| Lakiundu River | 182039 | Male.... | 144 | 87 | 52 | 33 | 29.9 | 25.7 | 61 | 48 | 110 | 66 | 59 | Basal suture closed. |
| Do | 182041 | ...do..... | 145 | 88 | 52 | 36 | 30.8 | 25.9 | 65 | 51 | 113 | 67 | 62 | Do. |
| Do | 182051 | ...do..... | 146 | 89 | 52 | 33 | 28.8 | 26.6 | 64 | 47 | 115 | 67 | 61 | Do. |
| Do | 182042 | Female. | 136 | 81 | 49 | 33 | 29.6 | 24.5 | 60 | 45 | 106 | 65 | 58 | Do. |
| Do | 182048 | ...do..... | 142 | 86 | 53 | 35 | 31.0 | 24.5 | 61 | 45 | 108 | 64 | 58 | Do. |
| Do | 182049 | ...do..... | 137 | 77 | 51 | 32 | 27.2 | 24.8 | 60 | 44 | 105 | 63 | 59 | Basal suture open. |

[1] Type.

*Measurements of skulls of Thos from British East Africa*—Continued.

| Form and locality. | No. | Sex. | Condylobasal length. | Zygomatic breadth | Mastoid breadth. | Postorbital constriction. | Interorbital constriction. | Rostral breadth over canine. | Lachrymal foramen to alveolar point. | Median length nasals. | Maudible. | Maxillary tooth row. | Lower molar—premolar row. | Observations. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *T. mesomelas mcmillani*—Con. | | | | | | | | | | | | | | |
| Archer's Post | 182131 | Male | 148 | 80 | 52 | 32 | 28.7 | 26.0 | 63 | 50 | 115 | 67 | 63 | Basal suture closed. |
| Do | 182133 | do | 149 | 85 | 54 | 35 | 30.1 | 25.7 | 65 | 49 | 115 | 68 | 63 | Do. |
| Do | 182132 | Female | 134 | 74 | 49 | 34 | 28.2 | 24.0 | 57 | 44 | 103 | 60 | 57 | Basal suture open |
| Do | 182137 | do | 138 | 80 | 51 | 35 | 28.6 | 24.3 | 59 | 48 | 107 | 64 | 59 | Basal suture closed. |
| Merelle Water | 184809 | Male | 139 | 83 | 51 | 33 | 29.9 | 24.4 | 59 | 48 | 107 | 63 | 54 | Do. |
| Do | 182076 | Female | 139 | 80 | 49 | 31 | 27.1 | 22.8 | 59 | 45 | 108 | 65 | 61 | Do. |
| Do | 182077 | do | 134 | 77 | 50 | 31 | 27.0 | 22.6 | 58 | 44 | 103 | 61 | 57 | Do. |
| Do | 182083 | do | 144 | 81 | 53 | 34 | 29.1 | 25.0 | 61 | 44 | 110 | 64 | 59 | Do. |
| Do | 182087 | do | 137 | 78 | 49 | 33 | 28.3 | 23.3 | 60 | 44 | 106 | 63 | 58 | Do. |
| Do | 182094 | do | 140 | 83 | 51 | 36 | 28.7 | 23.5 | 62 | 48 | 108 | 65 | 60 | Do. |
| Koya Water | 182109 | Male | 145 | 82 | 54 | 33 | 28.0 | ..... | 62 | 49 | 111 | 67 | 62 | Do. |
| Do | 182112 | do | 143 | 80 | 53 | 33 | 27.0 | 26.2 | 62 | 51 | ..... | 66 | ..... | Basal suture open. |

*External and dental measurements of adult specimens of Thos from British East Africa.*

| Form and locality. | No. | Sex. | Head and body. | Tail vertebræ. | Hind foot. | Ear from notch. | Upper carnassial. | First upper molar. | Lower carnassial. |
|---|---|---|---|---|---|---|---|---|---|
| *T. adustus bweha.* | | | | | | | | | |
| Guas Ngishu Plateau | 173019 | Male | ..... | ..... | ..... | ..... | 13.9×7.4 | 11.3×13.7 | 15.6×5.9 |
| Do | 173016 | Female | ..... | ..... | ..... | ..... | 13.7×7.0 | 11.6×13.4 | 15.7×6.3 |
| Kisumu | [1] 182342 | Male | 720 | 310 | 148 | 90 | 14.3×8.4 | 11.0×13.4 | 15.9×6.8 |
| Do | 182343 | do | 667 | 340 | 152 | 88 | 14.1×7.0 | 12.2×14.2 | 15.8×6.3 |
| Do | 182348 | do | 690 | 330 | 150 | 90 | 13.2×7.3 | 11.6×13.3 | 15.6×6.8 |

| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| *T. adustus notatus.* | | | | | | | | | |
| Nairobi | 162137 | Male | | | | | 14.1×6.6 | 11.5×13.2 | 15.1×5.8 |
| Loita Plains | 181488 | Female | 690 | 345 | 160 | 75 | 13.4×6.4 | 10.7×13.1 | 15.5×6.7 |
| *T. aureus bea.* | | | | | | | | | |
| Loita Plains | [1] 162904 | Female | 640 | 275 | 140 | 99 | 15.0×8.0 | 11.5×13.6 | 17.3×6.8 |
| Naivasha | 162139 | Male | | | | | 15.9×8.0 | 11.7×13.0 | 17.8×7.0 |
| Suswa Plains | 182007 | Female | | | | | 14.8×8.2 | 10.7×12.6 | 17.2×7.1 |
| Kasorongai River | 163293 | .....do | 680 | 300 | 160 | | 15.7×8.1 | 11.2×13.4 | 16.8×6.5 |
| Do | 163301 | .....do | 682 | 234 | 154 | | 14.8×8.4 | 10.5×13.7 | 16.9×6.8 |
| Oni | 163302 | .....do | 666 | 239 | 149 | | 14.6×7.9 | 10.6×12.2 | 15.8×6.5 |
| Laikipia | 164698 | .....do | 650 | 350 | 155 | 95 | 15.3×7.8 | 11.6×14.1 | 16.4×6.8 |
| *T. mesomelas elgonæ.* | | | | | | | | | |
| Guas Ngishu Plateau | [1] 164699 | Male | 600 | 325 | 150 | 100 | 16.5×7.8 | 11.1×15.1 | 17.3×6.5 |
| Do | 173017 | | | | | | 15.9×8.1 | 11.4×14.7 | |
| Do | 173020 | | | | | | 17.1×8.1 | 11.6×15.2 | 17.4×6.5 |
| Do | 173014 | | | | | | 15.5×8.0 | 10.6×13.8 | 17.1×6.5 |
| Do | 173018 | | | | | | 15.8×7.6 | 11.3×14.7 | 18.5×6.9 |
| Do | 164611 | Female | 640 | 310 | 146 | 105 | 14.3×7.0 | 9.7×13.7 | 16.3×6.2 |
| Do | 164614 | .....do | 700 | 350 | 152 | 110 | 15.8×7.6 | 10.6×14.3 | 17.5×6.4 |
| Do | 164752 | .....do | 650 | 340 | 150 | 102 | 16.2×7.6 | 11.5×14.6 | 17.8×6.2 |
| *T. mesomelas mcmillani.* | | | | | | | | | |
| Taveta | 18941 | | | | | | 16.7×7.9 | 10.9×14.5 | 18.4×7.1 |
| Mtoto Andei | [1] 181483 | Female | 690 | 350 | 140 | 95 | 15.0×7.4 | 10.6×14.2 | 16.1×6.2 |
| Ulukenia Hills | 164546 | | | | | | 17.4×7.0 | 10.9×14.3 | 17.9×6.7 |
| Loita Plains | 181503 | Female | 680 | 325 | 145 | 90 | 15.6×7.4 | 10.7×14.2 | 16.8×7.1 |
| Lime Springs | 181490 | Male | 690 | 360 | 158 | 112 | 16.9×7.7 | 11.2×14.7 | 17.7×7.0 |
| Do | 181491 | .....do | 770 | 335 | 150 | 100 | 16.8×8.0 | 11.2×15.0 | 18.2×7.6 |
| Do | 181489 | Female | 693 | 345 | 145 | 100 | 15.8×7.2 | 10.4×14.2 | 16.6×6.9 |
| Kabalolot Hill | 181493 | Male | 700 | 305 | 150 | 110 | 17.0×7.8 | 11.6×15.1 | 18.0×7.2 |
| Do | 181492 | Female | 710 | 360 | 152 | 112 | 15.4×7.8 | 9.8×13.8 | 16.5×6.3 |
| Do | 181494 | .....do | 740 | 325 | 150 | 108 | 15.2×7.5 | 10.2×13.4 | 16.6×6.9 |
| Telek River | 181499 | Male | 740 | 365 | 150 | 110 | 15.2×7.4 | 10.9×14.1 | 16.7×6.7 |
| Do | 181497 | Female | 650 | 330 | 145 | 103 | 15.3×7.3 | 10.1×13.8 | 16.4×6.6 |
| Do | 181498 | .....do | 690 | 350 | 155 | 103 | 15.4×7.3 | 10.4×14.6 | 17.5×7.0 |

*External and dental measurements of adult specimens of Thos from British East Africa*—Continued.

| Form and locality. | No. | Sex. | Head and body. | Tail vertebræ. | Hind foot. | Ear from notch. | Upper carnassial. | First upper molar. | Lower carnassial. |
|---|---|---|---|---|---|---|---|---|---|
| *T. mesomelas mcmillani*—Continued. | | | | | | | | | |
| Tolek River | 181500 | Female | 710 | 340 | 146 | 102 | 16.4×7.3 | 10.5×14.6 | 18.0×7.0 |
| Do | 181501 | do | 730 | 355 | 158 | 105 | 15.8×7.5 | 10.8×14.1 | 16.5×6.5 |
| So. Guaso Nyiro | 162135 | Male | | | | | 18.0×7.9 | 11.3×15.0 | 18.5×7.6 |
| Do | 162903 | do | 650 | 295 | 155 | 100 | 16.9×7.9 | 11.0×15.0 | 18.2×7.2 |
| Do | 162136 | Female | | | | | 17.3×8.3 | 11.3×14.9 | 17.9×7.4 |
| Lakiundu River | 182039 | Male | 680 | 365 | 156 | 102 | 16.5×7.5 | 11.3×15.6 | 17.9×7.1 |
| Do | 182041 | do | 710 | 350 | 165 | 110 | 15.1×6.5 | 10.1×13.3 | 17.0×6.6 |
| Do | 182051 | do | 730 | 360 | 155 | 103 | 16.8×7.8 | 11.0×15.4 | 17.9×7.4 |
| Do | 182042 | Female | 670 | 340 | 145 | 100 | 15.8×7.1 | 10.2×14.5 | 16.1×6.5 |
| Do | 182048 | do | 600 | 300 | 152 | 108 | 15.9×7.2 | 10.1×13.8 | 17.3×7.3 |
| Archer's Post | 182131 | Male | 750 | 350 | 154 | 112 | 18.3×7.9 | 12.1×16.3 | 19.4×7.4 |
| Do | 182133 | do | 730 | 360 | 162 | 110 | 16.8×7.1 | 11.3×15.1 | 18.0×7.4 |
| Do | 182137 | Female | 680 | 350 | 150 | 100 | 14.8×6.3 | 10.0×13.0 | 16.0×6.5 |
| Merelle Water | 184809 | Male | 690 | 330 | 153 | 108 | 14.6×7.6 | 9.3×13.2 | 16.6×7.0 |
| Do | 182076 | Female | 650 | 340 | 150 | 100 | 16.4×7.8 | 11.2×14.8 | 17.4×7.2 |
| Do | 182077 | do | 650 | 380 | 145 | 100 | 15.3×7.8 | 10.8×14.0 | 17.2×6.4 |
| Do | 182083 | do | 730 | 380 | 155 | 115 | 16.2×8.1 | 11.9×15.7 | 17.9×7.6 |
| Do | 182087 | do | 600 | 330 | 145 | 105 | 15.7×7.3 | 10.7×14.6 | 17.4×7.0 |
| Do | 182094 | do | 700 | 300 | 155 | 103 | 15.1×6.9 | 10.0×13.4 | 16.3×6.9 |
| Koya Water | 182109 | Male | 710 | 390 | 160 | 110 | 17.0×7.8 | 11.2×14.8 | 18.7×7.1 |

[1] Type.

LYCAON PICTUS LUPINUS Thomas.

1902. *Lycaon pictus lupinus* Thomas, Ann. and Mag. Nat. Hist., ser. 7, vol. 9, p. 439. June. (Nyuki River Swamp, Rift Valley, British East Africa; type in British Museum.)

1910. *Lycaon pictus lupinus* Roosevelt, African Game Trails, Amer. ed., p. 473; London ed., p. 485.

1914. *Lycaon pictus lupinus* Roosevelt and Heller, Life Hist. African Game Anim., vol. 1, p. 267.

*Specimens.*—Eleven, from the following localities:

British East Africa: Kabalolot Hill, Sotik, 5 (Heller); Kamiti Farm, Athi Plains, 2 (Mearns); Kilima Kui, 1 odd skull (Heller); Southern Guaso Nyiro River, 1 odd skull (Mearns); Telek River, Sotik, 1 (Rainey); Ulu Station, 1 (Rainey).

A young adult female collected by Mearns at Kamiti Farm weighed 31 pounds eviscerated. Merans's catalogue records of a specimen from the Southern Guaso Nyiro: "Iris yellowish-brown; naked parts black." The hunting dog is noted for great individual variation in color and color pattern; the three colors, black, ochraceous, and white, are not distributed exactly alike in any two skins. Examination of the series listed above, however, makes me believe that while a certain amount of what might be termed true "individual" variation really does occur, the immense differences between most of the animals can be explained by condition of pelage, rather than by genuine individual variation. Aside from irregularity in the white patches, which is a common condition in many mammals, the black and ochraceous areas are to a considerable degree regular in outline if the animal is in perfect coat. This does not often occur, apparently, as the skins in our series are in all stages of moult and renewal, though all were taken in two months, May and September.

This pied creature is found throughout East Africa, although it is rare in most places. Hunting dogs usually go in big packs. They master all the smaller and the young of all the larger antelopes, and there is reason to believe that at times, although rarely, they kill even the biggest antelope and half-grown buffalo also. Yet we saw zebras feeding near them without heeding them, and also rushing at them and driving them off when they came too close. They are extremely destructive to game, and at times to goats and sheep; and they will menace man, although we have no authentic instance of their actually attacking him. But Mr. Rainey, in the Northern Guaso Nyiro desert, saw a party of wild dogs chasing a lion; they did not bite him, but he was manifestly uneasy and concerned and trotted sheepishly along, endeavoring to get out of their way. (Roosevelt and Heller, Life Hist. African Game Anim., vol. 1, pp. 266, 267.)

Heller's field notes of the Rainey Expedition state that a hunting dog was trapped at Merelle Water and kept alive. The howling of the captive later atttracted a band of 11 wild dogs to within 300 yards of the camp at Quoy. In this band 10 were quite blackish and one much lighter in color. At Longaya Water the members of the expedition saw wild dogs run a dik-dik at midday.

For measurements of specimens see page 110.

*Measurements of skulls of Lycaon pictus lupinus from British East Africa.*

| Locality. | No. | Sex. | Condylobasal length. | Zygomatic breadth. | Mastoid breadth. | Postorbital constriction. | Interorbital constriction. | Rostral breadth over canine. | Lachrymal foramen to alveolar point. | Median length nasals. | Mandible. | Maxillary tooth row. | Lower molar premolar row. | Observations. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Kabalolot Hill | 181508 | Male | 195 | 132 | 76 | 42 | 41 | 51 | 83 | 63 | 156 | 86 | 81 | Basal suture closed. |
| Do | 181509 | do | 190 | 129 | 71 | 43 | 39 | 50 | 84 | 57 | 151 | 84 | 81 | Basal suture open. |
| Do | 181512 | do | 195 | 137 | 76 | 41 | 41 | 51 | 87 | 63 | 157 | 86 | 83 | Basal suture closed. |
| Do | 181510 | Female | 190 | 129 | 73 | 41 | 42 | 50 | 84 | 55 | 149 | 84 | 79 | Do. |
| Do | 181511 | do | 191 | 128 | 74 | 42 | 41 | 49 | 85 | 57 | 151 | 84 | 80 | Do. |
| Telek River | 181513 | Male | 181 | 121 | 70 | 42 | 37 | 46 | 79 | 57 | 141 | 77 | 74 | Basal suture open. |
| So. Guaso Nyiro | 162878 | | 189 | 126 | 72 | 42 | 41 | 47 | 84 | 61 | 148 | 82 | 76 | Basal suture closed. |
| Kilima Kui, Kapiti | 161908 | | 192 | 131 | 77 | 44 | 43 | 48 | 85 | 59 | 152 | 82 | 81 | Do. |
| Kamiti | 163290 | | 183 | 126 | 70 | 39 | 42 | 44 | 80 | 58 | 142 | 78 | 76 | Do. |
| Do | 163291 | Female | 174 | 113 | 70 | 43 | 37 | 44 | 78 | 47 | 139 | 77 | 76 | Basal suture open. |

*External and dental measurements of specimens of Lycaon pictus lupinus from British East Africa.*

| Locality. | No. | Sex. | Head and body. | Tail vertebræ. | Hind foot. | Ear. | Upper carnassial. | First upper molar. | Lower carnassial. |
|---|---|---|---|---|---|---|---|---|---|
| Kabalolot Hill | 181508 | Male | 960 | 410 | 233 | 135 | 22.2×11.5 | 16.8×18.7 | 27.0×10.7 |
| Do | 181509 | do | 1040 | 370 | 230 | 132 | 22.2×10.8 | 16.3×19.4 | 26.4×10.4 |
| Do | 181512 | do | 970 | 380 | 235 | 135 | 21.1×11.2 | 16.3×17.8 | 25.3×10.2 |
| Do | 181510 | Female | 1050 | 350 | 220 | 135 | 20.7×11.3 | 15.9×19.1 | 24.9× 9.6 |
| Do | 181511 | do | 970 | 375 | 220 | 135 | 20.6×10.6 | 16.2×18.1 | 25.1× 9.5 |
| Telek River | 181513 | Male | | | | | 19.7×11.1 | 14.8×17.3 | 22.9× 8.9 |
| So. Guaso Nyiro | 162878 | | | | | | 21.4×11.3 | 15.5×18.5 | 24.9× 9.4 |
| Kilima Kui, Kapiti | 161908 | | | | | | 20.9×11.8 | 16.4×18.3 | 25.1×10.2 |
| Kamiti | 163290 | | | | | | 20.1×11.0 | 15.3×18.0 | 24.3× 9.7 |
| Do | 163291 | Female | 925 | 345 | 230 | 120 | 20.6×10.8 | 16.3×18.8 | 24.4× 9.0 |

### Genus OTOCYON Müller.

1836. *Otocyon* MÜLLER, Archiv. Anat. & Phys. Med., p. L. (*O. megalotis.*)

The great-eared "fox" is represented in the East African collections by two closely related forms, which later doubtless will prove, with *Otocyon megalotis* of South Africa, to be geographic races of a single species.

#### OTOCYON CANESCENS Cabrera.

1910. *Otocyon canescens* CABRERA, Ann. and Mag. Nat. Hist., ser. 8, vol. 6, p. 462. November. (Burao, Somaliland; type in British Museum.)

*Specimen.*—One imperfect skin from—

ABYSSINIA: Adis Ababa (Philip).

#### OTOCYON VIRGATUS Miller.

Plates 22, 23, 24.

1892. *Otocyon megalotis* TRUE, Proc. U. S. Nat. Mus., vol. 15, p. 455. (Not of Desmarest.)

1909. *Otocyon virgatus* MILLER, Smithsonian Misc. Coll., vol. 52, p. 485. December 18. (Naivasha Station, British East Africa; type in U. S. Nat. Mus.)

1910. *Otocyon virgatus* ROOSEVELT, African Game Trails. Amer. ed., pp. 473 and 486; [1] London ed., pp. 485 and 497.[1]

*Specimens.*—Seventeen, from localities as follows:

BRITISH EAST AFRICA: "British East Africa," 1 skull (S. A. Ex.); Engare Narok River, 1 (Rainey); Lakiundu River, 1 (Heller); Loita Plains, 1 (Heller); Naivasha Station, 8 (Mearns, Loring); Southern Guaso Nyiro River, 1 (Rainey); Taveta, 1 (Abbott); Telek River, 1 (Rainey).

GERMAN EAST AFRICA: Aruscha Wa-cini, 2 (Abbott).

Mearns and Loring record the following weights of specimens collected at Lake Naivasha: Males, old adult (type), 8½ pounds; young adult, 6½ pounds. Females, two adults, each 6½ pounds. Doctor Abbott's labels on the specimens from the Kilimanjaro region record the native Kichaga name of the animal as *Kipara*. Loring's notes on the species at Naivasha are in part as follows:

All of the specimens secured were taken by "jacking" at night, although, while traveling over the Uganda Railroad, we frequently saw them singly or in pairs in broad daylight. The white people knew nothing of a fox in this country, and had always called them "jackals." They seemed to live in pairs and groups of three to six. On dark nights it was usually easy to shine their eyes and approach within shooting range. Often the foxes would slink about for some time before we got within gunshot range. Frequently we saw two and sometimes three and four standing so close together that it was surprising that the spread of the shot did not kill more than one. One evening Dr. Mearns and I started out about 9 o'clock and returned about midnight. Most of the hunting was done on an elevated brushy plateau, within short distance of a native village, where the occupants were singing, dancing, and playing their crude stringed instruments. We ran into a bunch of five of these foxes and got four of them, none of which was the young of the year. One fox was killed

[1] "*virgartus.*"

within 200 yards of the railroad station, and at dusk one evening I saw a fox emerge from a burrow close to a group of natives and scamper across the flat. The stomachs of several were examined and found to contain about a quart of termites and other insects. (Roosevelt's African Game Trails, Appendix C, pp. 486–487.)

As will be seen from the accompanying table of measurements, there is considerable variation in size and proportions of the skull and teeth in this series of *Otocyon* from British East Africa. Conclusions based on so small a series of each form as examined and measured by Cabrera [1] would not seem to be of much value; and, although the three forms recognized will doubtless prove to differ sufficiently in color so that they may be retained as subspecies of *megalotis*, the characters of size and proportions of skull are of little or no use in differentiating the forms. Good series of skins and skulls from Abyssinia, Somaliland, and South Africa are now much needed to work out the relationships between these forms, as well as the real characters which distinguish them one from another.

For measurements see table, page 113.

## Family MUSTELIDÆ.

### Genus MELLIVORA Storr.

1780. *Mellivora* Storr, Prodr. Meth. Mamm., tab. A. (*M. capensis.*)

Several forms of the honey-badger have been named from various parts of Africa. These have been for the most part based on single specimens or very small series, and until suitable collections of skins and skulls are assembled for serious monographic work the status of several named species is perhaps uncertain. On geographic grounds alone it would seem that most of the named forms must stand in the final revision. The two species listed below, on the basis of the limited material at hand, seem distinct and well marked.

#### MELLIVORA ABYSSINICA Hollister.

Plate 25.

1910. *Mellivora abyssinica* Hollister, Smithsonian Misc. Coll., vol. 56, No. 13, p. 1. October 10. (Suksukki River, Abyssinia; type in U. S. Nat. Mus.)

1911. *Mellivora abyssinica* Hollister, Proc. Biol. Soc. Washington, vol. 24, p. 37. February 24.

*Specimen.*—One, the type, as follows:

Abyssinia: Suksukki River, 1 (Philip).

In the original account of this species the type locality was given as "vicinity of Adis Ababa," Abyssinia. Later information received from the collector, the Hon. Hoffman Philip, gives the exact locality where the specimen was killed as near the "Suksukki River, a small stream which connects Lake Zwai with Lake Horo Schalo, about

[1] Ann. and Mag. Nat. Hist., ser. 8, vol. 6, p. 463. November, 1910.

*Measurements of specimens of Otocyon virgatus.*

| Locality. | No. | Sex. | Head and body. | Tail vertebræ. | Hind foot. | Skull: Condylobasal length. | Zygomatic breadth. | Mastoid breadth. | Rostral breadth over canine. | Lachrymal foramen to alveolar point. | Maxillary tooth row. | Width of $m^1$. | Lower tooth row from canine. | Observations. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| B. E. A.: | | | | | | | | | | | | | | |
| Lakiundu River | 182031 | Male | 470 | 310 | 120 | 107 | 57 | 44 | 17 | 44 | 44 | 6.5 | 50 | Basal suture open. |
| Lake Naivasha | 162120 | do | 560 | 270 | 130 | 105 | 58 | 42 | 18 | 41 | 41 | 6.3 | 48 | Do. |
| Do | 162122 | do | 520 | 175 | 132 | 105 | 60 | 45 | 19 | 42 | 41 | 6.3 | 48 | Do. |
| Do | 162125 | do | ..... | ..... | ..... | 105 | 62 | 47 | 18 | 42 | 41 | 6.5 | 48 | Basal suture closed. |
| Do | [1] 162126 | do | 550 | 281 | 137 | 113 | 65 | 48 | 19 | 47 | 45 | 6.4 | 52 | Do. |
| Do | 162127 | do | 531 | 292 | 127 | 108 | 59 | 45 | 18 | 44 | 43 | 6.2 | 49 | Basal suture open. |
| Do | 162121 | Female | 540 | 270 | 125 | 105 | 58 | 45 | 17 | 41 | 41 | 6.3 | 48 | Do. |
| Do | 162123 | do | 520 | 270 | 120 | 102 | 59 | 43 | 17 | 42 | 41 | 6.4 | 47 | Do. |
| Do | 162124 | do | 525 | 275 | 120 | ..... | ..... | ..... | ..... | 42 | 41 | 6.4 | 47 | Teeth moderately worn. |
| Telek River | 181502 | do | 500 | 280 | 108 | 106 | 57 | 42 | 17 | 43 | 42 | 6.4 | 48 | Basal suture open. |
| Ngare Narok River | 181485 | Male | 480 | 230 | 115 | 105 | 62 | 46 | 18 | 43 | 40 | 6.5 | 48 | Basal suture closed. |
| Southern Guaso Nyiro | 181487 | do | ..... | ..... | ..... | 105 | 62 | 45 | 18 | 43 | 41 | 6.5 | 47 | Do. |
| Loita Plains | 181506 | ..... | ..... | ..... | ..... | 99 | 59 | 43 | 17 | 38 | 38 | 6.5 | 45 | Do. |
| Taveta | 35099 | ..... | ..... | ..... | ..... | 109 | 62 | 45 | 19 | 45 | 43 | 6.9 | 49 | Do. |
| G. E. A.: Aruscha Wa-cini | 38694 | Male | ..... | ..... | ..... | 110 | 62 | 47 | 19 | 45 | 44 | 6.0 | 49 | Do. |
| Do | 38695 | Female | ..... | ..... | ..... | 107 | 60 | 45 | 18 | 45 | 43 | 6.5 | 50 | Do. |

[1] Type.

midway between the two lakes, which, with others, lie between 7° and 8° north latitude and between 38° and 39° longitude east. Altitude, 4,500 to 5,000 feet."

MELLIVORA SAGULATA Hollister.

Plates 26, 27.

1892. *Mellivora capensis* TRUE, Proc. U. S. Nat. Mus., vol. 15, p. 455. (Not of Schreber.)

1910. *Mellivora ratel* ROOSEVELT, African Game Trails, Amer. ed., p. 473; London ed., p. 485. (Not of Sparrman.)

1910. *Mellivora sagulata* HOLLISTER, Smithsonian Misc. Coll., vol. 56, No. 13, p. 2. (Mount Kilimanjaro, German East Africa; type in U. S. Nat. Mus.)

*Specimens.*—Four, from localities as follows:

BRITISH EAST AFRICA: Mau Hills, 15 miles north of Ravine Station, 1 (K. Roosevelt); Nairobi, 2 (Heller, Turner).

GERMAN EAST AFRICA: Mount Kilimanjaro,5,000 feet altitude, 1 (Abbott).

Variations in color, which have been used in differentiating forms of honey-badgers, are probably of less importance than skull characters. There appears to be considerable seasonal or pelage difference in the intensity of the white side stripe; and color of mantle is perhaps largely influenced by season, wear, or stain from soil. All the recognizable forms will doubtless prove to be merely geographic races of the Cape species, *Mellivora capensis*.[1]

Genus ICTONYX Kaup.

1835. *Ictonyx* KAUP, Das Thierreich, vol. 1, p. 352. (*I. striatus*.)[2]

1906. *Ictonyx* HOWELL, Proc. Biol. Soc. Washington, vol. 19, p. 46. February 26.

A single form of the striped muishond is included in the collection. Other races have been named from the Upper Nile, Sudan, and Abyssinia.

ICTONYX STRIATUS ALBESCENS Heller.

Plate 11, figs. 3, 4, 5.

1913. *Ictonyx capensis albescens* HELLER, Smithsonian Misc. Coll., vol. 61, No. 13, p. 13. September 16. (Mount Lololokwi, British East Africa; type in U. S. Nat. Mus.)

*Specimens.*—Four, from localities as follows:

BRITISH EAST AFRICA: Kapiti, 1 (Johnston); Mount Lololokwi, 1 (Heller); Nairobi, 1 (Klein); Ulukenia Hills, 1 (Loring).

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[1] This name has priority over *M. ratel;* see Hollister, Proc. Biol. Soc. Washington, vol. 25, p. 96. May 4, 1912.

[2] *Bradypus striatus* Perry, Arcana or The Museum of Natural History, part 11, pl. [41] and text. November, 1810. See Hollister, Proc. Biol. Soc. Washington, vol. 28, p. 184. November 26, 1915.

### Genus AONYX Lesson.

1827. *Aonyx* Lesson, Man. Mamm., p. 157. (*A. capensis.*)

In addition to the two races of the Cape clawless otter listed below, a third subspecies, *Aonyx capensis meneleki* (Thomas) has been described from Zegi, Lake Tsana, Abyssinia.

#### AONYX CAPENSIS HINDEI (Thomas).

1905. *Lutra capensis hindei* Thomas, Ann. and Mag. Nat. Hist., ser. 7, vol. 15, p. 78. (Fort Hall, British East Africa; type in British Museum.)

*Specimen.*—One, as follows:

British East Africa: Thika River (Turner).

This animal, a female topotype specimen of the race, measured fresh: Head and body, 690 mm.; tail, 465; hind foot, 140; ear, 20. It was killed by natives and received fresh by Mr. Turner.

#### AONYX CAPENSIS HELIOS Heller.

Plates 28, 29.

1913. *Aonyx capensis helios* Heller, Smithsonian Misc. Coll., vol. 61, No. 19, p. 1. November 8. (40 miles southwest of Kericho, Sotik District, British East Africa; type in U. S. Nat. Mus.)

*Specimen.*—One, as follows.

British East Africa: Sotik, 40 miles southwest of Kericho (Turner).

The characters separating this race from *Aonyx capensis hindei* are slight, and much more material is needed to determine its status satisfactorily. As with the ratels, sufficient series must be assembled from various regions so that the real geographic characters may be distinguished from purely individual differences. Colonel Roosevelt saw several otters while hunting hippopotamuses in Lake Naivasha,[1] and great efforts should be made by sportsmen and travelers to collect skins and skulls and deposit them in museums.

## Family VIVERRIDÆ.

### Genus VIVERRA Linnæus.

1758. *Viverra* Linnæus, Syst. Nat., ed. 10, p. 43. (*V. zibetha.*)
1915. *Civettictis* Pocock, Proc. Zool. Soc. London, p. 134. March. (*V. civetta.*)

The African civet was first described by Schreber from "Guinea, Congo, the Cape of Good Hope, and Ethiopia."[2] A form from Zanzibar was described by Matschie in 1891, and in "Die Säugethiere Deutsch-Ost-Afrikas" the distribution of this new species was given to include the Kilimanjaro region. It would seem on geographical grounds that our single specimen should be referred to this form.

[1] African Game Trails, p. 214. 1910.
[2] Schreber, Säugthiere, vol. 3, pp. 418–420. 1778.

Mr. Pocock has separated the African civet from the Oriental species under the new generic name *Civettictis*. While admitting the importance of the characters he has discovered in this connection, I should prefer to recognize the two groups as subgenera, rather than full genera, until he can study fresh material of all the species.

VIVERRA CIVETTA ORIENTALIS Matschie.

1891. *Viverra civetta orientalis* MATSCHIE, Archiv. f. Naturg., p. 352. (Zanzibar Island; type in Berlin Museum.)

*Specimen.*—One, as follows:

BRITISH EAST AFRICA: Voi (Heller).

The following manuscript notes on the type-specimen of this form were made by Heller at the Berlin Museum:

Type A5329, Zanzibar Id. (Coll. Hildebrandt); skin mounted; young, the skull with last molar not in place. Color of upperparts chiefly whitish silvery, black spots on sides smaller than white interspaces and not well defined; black of mane also flanked by broad white stripes. Arm, foot, and throat black; head with whole crown and tip of snout whitish, sides of face and band across before eyes black. Color much lighter than the mainland skins I have seen. Skull with all sutures open, last lower and upper molars not yet erupted. Condyloincisive length, 140; zygomatic breadth, 67; interorbital breadth, 25; postorbital breadth, 22.4; nasals 35.5 × 14, length upper carnassial, 11.6; mandible 102.

The skin from Voi is without a skull but is apparently adult. It is, I should judge, somewhat darker than the type, and the spots on the sides of the body are well marked and conspicuous against the whitish background; the long hairs of the dorsal mane are decidedly ochraceous and tipped with glossy black; the legs, feet, and terminal half of the tail are brownish black; shoulders grizzly, mixed black and gray or whitish, the spotting not distinct; crown buffy, mixed with blackish and sides of nose white. This skin is conspicuously different from skins in the museum collected in Congo and Cameroons. It is much lighter in color, the underparts whitish or light gray instead of blackish. On the entire sides and upperparts the white predominates, the black spots being much smaller, though more sharply marked, than in the West African skins.

Genus GENETTA Oken.

1816. *Genetta* OKEN, Lehrb. Naturg., 3ter Theil, 2te Abth., p. 1010. (*G. genetta.*)

On account of the very great amount of individual variation in color and color pattern, the genets are difficult mammals to determine satisfactorily without suitable series for study. Three general types are represented in the collections, and the material has usually been sufficient for definite identifications. The *dongalana* group is characterized by the distinct dorsal mane and long-haired tail; the smaller *bettoni* by the absence of a distinct dorsal stripe and the very narrow light tail rings; and the *stuhlmanni* group by the dark dorsal

stripe without mane, and comparatively short-haired tail. The pygmy *Genetta pumila* is a member of the latter group. A very large species, *Genetta victoriæ* Thomas, described from Entebbe, Uganda, and later recorded from the Congo forest near Ruwenzori, is not represented in our collections.

For tables of measurements of specimens of genets see pages 121-123.

GENETTA DONGALANA NEUMANNI Matschie.

1902. *G[enetta] neumanni* MATSCHIE, Verhandl. des V. Internat. Zool.-Congr. Berlin, p. 1140. (Irangi, German East Africa; type in Berlin Museum.)

*Specimens.*—Eleven, from localities as follows:

UGANDA: "Uganda," 1 (Rosenberg).

BRITISH EAST AFRICA: Engare Ndare River, 1 (Heller); Isiola River, 1 (Heller); Lakiundu River, 1 (Heller); Merelle Water, 3 (Heller); Ulukenia Hills, 1 (Loring); Voi, 3, including 2 large embryos (Heller).

Heller in his field catalogue records the stomach contents of various specimens as follows: Isiola River, July 2, remains of a *Saccostomus;* Merelle Water, July 25, one with remains of sand grouse and a centipede and another beetles; Voi, November 20, spiders and grasshoppers. The Voi specimen contained two large embryos. November 20, size of small rats.

I find no appreciable color differences between specimens from Voi and Ulukenia Hills, which must represent Matschie's *neumanni*, and specimens from the Marsabit country north of Kenia. The Voi skull has slightly larger auditory bullæ than the northern skulls, but there is considerable variation in this feature among the Marsabit and Northern Guaso Nyiro specimens. No material representing Neumann's *Genetta hararensis*[1] described from Harar, Abyssinia, is available. Neither does the museum possess specimens of true *dongalana*[2] from Nubia. I am therefore unable to satisfy myself regarding the distinctness of these forms. The characters given by Matschie, in his key to the species, to separate *dongalana* from *neumanni* are all absolutely valueless; the relative breadth of the light and dark rings on the tail differs in specimens collected the same day in the same camp and is greatly changed temporarily by renewal from the old long coat into fresh hair. This is well shown by our material. The numbers of dark and light rings on the tail are easily miscounted, and two persons will frequently count them differently on the same skin, owing to the obscurity of the dark basal rings, which may or may not be counted. Doubtless careful study of suitable series of each form from the type regions will reveal characters

[1] Sitz.-ber. Ges. nat. Freunde Berlin, 1902, p. 183. November.

[2] *V[iverra] dongolana* Hemprich and Ehrenberg, Symbolae Physicae, pt. 1, dec. 2, text of *Herpestes leucura* p. 6. 1832.

of more importance, as it is hard to believe the animal ranges unchanged throughout this great region.

The following manuscript notes on the type specimen of *Genetta dongalana neumanni* were made by Heller in Berlin:

Type of *Genetta neumanni* Matschie; Irangi, ♀, A5576, O. Neumann; skin stuffed; skull perfect. Black dorsal mane; body spots russet; tail with seven black rings [original description says nine], tip blackish but apparently part of end is gone. Skull condylo-incisive length, 92 millimeters; zygomatic breadth, 45; interorbital breadth, 14.2; postorbital breadth, 15; nasals 23.3 × 8; length of upper tooth row, including canine, 36; length of mandible, 65.

The specimen listed above from "Uganda" is a mounted skin with skull. It is very young, still in the milk dentition, and is therefore identified only provisionally with *neumanni*. The specimen was purchased from W. F. H. Rosenberg, and is without definite data.

GENETTA BETTONI Thomas.

1902. *Gennetta bettoni* Thomas, Ann. and Mag. Nat. Hist., ser. 7, vol. 9, p. 365. (Lagari, Mau District, south of El Burgon Range, British East Africa; type in British Museum.)

*Specimens.*—Two, from the following localities:

British East Africa Kakumega River, 1 (Heller); Lukosa River, 1 (Heller).

The stomach of the specimen trapped at the Kakumega River contained insects and mice. The Lukosa River skin was purchased from a native.

GENETTA STUHLMANNI STUHLMANNI Matschie.

1892. *Genetta pardina* True, Proc. U. S. Nat. Mus., vol. 15, p. 454. (Part, specimens from Mount Kilimanjaro; not of Geoffroy.)

1902. *G[enetta] stuhlmanni* Matschie, Verhandl. des V. Internat. Zool.-Congr. Berlin, p. 1142. (Bukoba, German East Africa; type in Berlin Museum.)

1910. *Genetta bettoni* Roosevelt, African Game Trails, Amer. ed., p. 473; London ed., p. 485. (Not of Thomas.)

*Specimens.*—Twenty-nine, from localities as follows:

Uganda: Nkyanuna, 1 (Heller); Ruwenzori East, 1 (Dent).

British East Africa: Kabalolot Hill, Sotik, 1 (Heller); Kaimosi, 4 (Heller); Lake Naivasha, 4 (Heller); Lukosa River, 5 (Heller); Mount Kenia, west side at 8,500 feet, 7 (Loring, Mearns); Mount Lololokwi, 1 (Heller); Nzoia River, Guas Ngishu Plateau, 1 (Heller); Telek River, Sotik, 1 (Heller).

German East Africa: Mount Kilimanjaro, at 5,000 feet, 3 (Abbott).

A female of this *Genetta* collected at Lukosa River, February 11, contained two embryos. Heller found the stomachs of the Lukosa River specimens filled with frogs and birds; one stomach held seven frogs.

I am unable to discover geographical variation of any consequence over all the region represented by the above listed material. There is, as usual in *Genetta*, an immense amount of individual variation in color and color pattern, but on the whole the series is readily distinguishable from the eastern *erlangeri* by darker appearance and considerably darker tail. The specimens from Lake Naivasha and the Sotik average a little larger in size than those from other places, and have broader skulls, but the difference is of little consequence. One melanistic specimen, in which the pattern of the markings is faintly shown, is in the Mount Kenia series.

There are plainly two geographic races of this species in the collection. As shown by our material, true *stuhlmanni* ranges east to Kenia and Kilimanjaro, where it gives way to the next form, *erlangeri*. No specimens from the actual coast strip, including the type-locality of *Genetta suahelica* Matschie, are in the collection.

Inasmuch as no description of the actual type-specimen of *Genetta stuhlmanni* was given by Matschie, the following notes made by Heller in Berlin are interesting:

*Genetta stuhlmanni* Matschie. Type A5577; Bukoba; skull A5578; occipital region cut away, not old, maxillary-palatine suture still open. Skin stuffed; color of dorsal stripe and spots same as *suahelica*. Skull: Length postglenoid process to incisors, 58.3; zygomatic breadth, 41; interorbital breadth, 11.5; post-orbital breadth, 11.5; upper tooth row including canine, 33; nasals, 16 × 7.5; length of mandible, 57; palatal length, 41.

GENETTA STUHLMANNI ERLANGERI Matschie.

1892. *Genetta pardina* True, Proc. U. S. Nat. Mus., vol. 15, p. 454. (Part, specimens from Taveta; not of Geoffroy.)

1902. *G[enetta] erlangeri* Matschie, Verhandl. des V. Internat. Zool.-Congr. Berlin, p. 1143. (Kitui, British East Africa; type in Berlin Museum.)

*Specimens.*—Twenty, from localities as follows:

British East Africa: Maji-ya-chumvi, 4 (Heller); Mariakani, 1 (Heller); Mount Mbololo 4, (Heller); Mtoto Andei, 3 (Heller); Ndi, 1 (Heller); Taveta, 3 (Abbott); Ulukenia Hills, 2 (Loring); Voi, 2 (Heller).

While certain skins in this series approach in color some specimens of *stuhlmanni*, the series as a whole is remarkably pale colored; the ground color of the body decidedly buff or yellowish-buff, and the dark tailrings reddish rather than seal-brown or blackish. The form represented seems clearly entitled to recognition as a subspecies. The distribution merges into, rather than overlaps, that of *stuhlmanni*.

The following notes on the type-specimen were made by Heller in Berlin:

*Genetta erlangeri*. Type, A2170; Kitui, Ukamba; Hildebrandt, collector; skin mounted, skull perfect. Color—light reddish type of *Genetta*, the dorsal stripe russet and same color as the spots on back and sides; ground color everywhere buffy; tail

rings darker but still chocolate brown, not seal brown. Skull number 5333—condylo-incisive length, 90; zygomatic breadth, 45; interorbital width, 13.4; postorbital width, 9.2; nasals, 19 + × 7.5; upper tooth row including canine, 35; mandible length, 63.

We have no specimens from within the coast strip region from which Matschie described still another form, *Genetta suahelica*.[1]

Heller's notes taken on the type-specimen of this race in Berlin are as follows:

*Genetta suahelica* Matschie. Type, ♀ A6577, Tanga, German East Africa; O. Neumann. Skin stuffed, skull perfect. Color, dorsal stripe black, spots on back and sides with russet centers and seal-brown margins; ground color buffy. Very close in color to Nairobi forest specimens. Skull: condylo-incisive length, 88; zygomatic width, 48; interorbital width, 14; postorbital width, 12; nasals, 20.5 × 8; upper tooth row including canine, 33.2; mandible length, 60.

GENETTA PUMILA Hollister.

Plate 30.

1916. *Genetta pumila* Hollister, Smithsonian Misc. Coll., vol. 66, No. 1, p. 4, February 10. (Mount Gargues, British East Africa; type in U. S. Nat. Mus.)

*Specimen.*—One, as follows:

British East Africa: North Creek, Mount Gargues, at 6,000 feet (Heller).

This pygmy form of the *stuhlmanni* group is recognizable from other East African genets by size alone. It is known only from the type-specimen which was captured by the Rainey expedition of 1911.

Genus NANDINIA Gray.

1843. *Nandinia* Gray, List. Mamm. Brit. Mus., pp. xx and 54. (*N. binotata.*)

Although forms of the African palm civet were known from Mount Kilimanjaro and Ruwenzori, the specimens constituting the type series of Heller's new subspecies, listed below, were the first to be recorded from British East Africa.

NANDINIA BINOTATA ARBOREA Heller.

Plate 31.

1913. *Nandinia binotata arborea* Heller, Smithsonian Misc. Coll., vol. 61, No. 13, p. 9. September 16. (Lukosa River, British East Africa; type in U. S. Nat. Mus.)

*Specimens.*—Three, from the following localities:

British East Africa: Kaimosi, 1 (Heller); Kakumega, 1 (Heller); Lukosa River, 1 (Heller).

The specimen from Kaimosi is immature. The measurements of the adult male type from Lukosa River and the adult female from Kakumega are: Head and body, 550, 490; tail vertebræ, 625, 570; hind foot, 95, 80; ear, 38, 38; condylobasal length of skull, 106, 96;

[1] Verhandl. des V. Internat. Zool.-Congr. Berlin, p. 1143. 1902.

*Measurements of adult specimens of Genetta.*

| Form and locality. | No. | Sex. | Head and body. | Tail vertebræ. | Hind foot. | Skull: Condylobasal length. | Zygomatic breadth. | Mastoid breadth. | Interorbital breadth. | Lachrymal foramen to alveolar point. | Maxillary tooth row. | Length upper carnassial. | Lower tooth row, canine—$m_2$. | Observations. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *G. d. neumanni.* | | | | | | | | | | | | | | |
| B. E. A.: | | | | | | | | | | | | | | |
| Merelle Water | 182702 | Male | 470 | 450 | 80 | 88 | 47 | 28.6 | 13.7 | 28.1 | 36.2 | 8.0 | 39.7 | Teeth moderately worn. |
| Do | 182206 | Female | ..... | ..... | ..... | 86 | 44 | 27.5 | 13.2 | 27.4 | 35.5 | 8.0 | 38.6 | Do. |
| Lakiundu River | 182052 | ...do | 470 | 470 | 85 | 88 | 45 | 27.5 | 13.0 | 27.3 | 35.2 | 7.9 | 38.0 | Do. |
| Isiola River | 182021 | Male | 470 | 460 | 84 | 90 | 45 | 28.2 | 13.0 | 28.1 | 35.7 | 8.9 | 39.6 | Do. |
| Fugare Ndare River | 184798 | ...do | ..... | ..... | ..... | 89 | 45 | 28.2 | 14.2 | 27.4 | 35.3 | 7.8 | 38.8 | Do. |
| Ulukenia Hills | 164150 | Female | 454 | 430 | 84 | 88 | 43 | 28.7 | 12.8 | 26.8 | 35.6 | 7.4 | 37.7 | Teeth considerably worn. |
| Voi | 182258 | ...do | 440 | 475 | 79 | 89 | 45 | 28.4 | 13.1 | 27.9 | 35.4 | 7.8 | 38.4 | Teeth moderately worn. |
| *G. bettoni.* | | | | | | | | | | | | | | |
| B. E. A.: Kakumega | 182700 | Female | 450 | 390 | 78 | 84 | 42 | 26.7 | 12.5 | 24.3 | 32.3 | 7.4 | 35.6 | Teeth moderately worn. |
| *G. s. stuhlmanni.* | | | | | | | | | | | | | | |
| Uganda: Nkyanuma | 164583 | Female | 460 | 425 | 82 | 87 | 44 | 27.6 | 11.9 | 25.6 | 32.2 | 7.2 | 34.9 | Teeth moderately worn. |
| B. E. A.: | | | | | | | | | | | | | | |
| Knimosa | 182344 | Male | 470 | 415 | 83 | 88 | 44 | ..... | 12.2 | 25.6 | 33.8 | 8.4 | 38.2 | Do. |
| Do | 182345 | ...do | 470 | 420 | 78 | 89 | 44 | 28.5 | 12.9 | 26.8 | 32.5 | 7.3 | 35.0 | Teeth considerably worn. |
| Do | 182708 | ...do | 480 | 410 | 88 | 91 | 44 | 29.1 | 12.0 | 27.3 | 33.7 | 8.3 | 37.0 | Teeth moderately worn. |
| Do | 182709 | ...do | 465 | 415 | 83 | ..... | ..... | ..... | ..... | 25.4 | 32.8 | 7.5 | 36.1 | Do. |
| Lukosa River | 182358 | ...do | 450 | 420 | 85 | 85 | 41 | 27.2 | 11.6 | 25.2 | 32.3 | 7.3 | 34.3 | Do. |
| Do | 182360 | ...do | 470 | 410 | 79 | 86 | 42 | 26.6 | 11.2 | 25.5 | 33.4 | 8.2 | 36.9 | Do. |

*Measurements of adult specimens of Genetta*—Continued.

| Form and locality. | No. | Sex. | Head and body. | Tail vertebræ. | Hind foot. | Skull: Condylobasal length. | Zygomatic breadth. | Mastoid breadth. | Interorbital breadth. | Lachrymal foramen to alveolar point. | Maxillary tooth row. | Length upper carnassial. | Lower tooth row, canine—$m_2$. | Observations. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *G. s. stuhlmanni*—Continued. | | | | | | | | | | | | | | |
| B. E. A.—Continued. | | | | | | | | | | | | | | |
| Lukosa River | 182380 | Male | 440 | 410 | 82 | 85 | ..... | ..... | 11.0 | 24.2 | 31.5 | 7.6 | 34.6 | Teeth moderately worn. |
| Do | 182379 | Female | 440 | 400 | 77 | 83 | ..... | 27.3 | 11.7 | 24.7 | ..... | 7.4 | 33.9 | Do. |
| Do | 182381 | ...do | 430 | 380 | 77 | 83 | 43 | 27.2 | 11.8 | 24.2 | ..... | 7.6 | 34.3 | Teeth much worn. |
| Lake Naivasha | 162908 | Male | 490 | 460 | 84 | 90 | 47 | 31.1 | 13.4 | 26.8 | 34.1 | 8.2 | 37.1 | Teeth moderately worn. |
| Do | 162909 | ...do | 495 | 460 | 85 | 90 | 49 | 28.7 | 14.4 | 28.2 | 34.8 | 8.4 | 37.9 | Do. |
| Do | 162910 | ...do | 480 | 450 | 85 | 87 | 46 | 28.2 | 12.8 | 25.7 | 33.0 | 8.2 | 35.9 | Do. |
| Do | 162911 | ...do | 485 | 470 | 87 | 88 | 46 | 28.9 | 12.6 | 26.5 | 33.8 | 8.6 | 37.3 | Do. |
| Telek River | 181549 | Female | 450 | 445 | 82 | 87 | 44 | 28.2 | 13.1 | 26.7 | 33.6 | 8.5 | 37.4 | Do. |
| Kabalolot Hill | 181547 | Male | 500 | 450 | 90 | 91 | 48 | 28.8 | 13.5 | 27.3 | 34.1 | 8.4 | 36.8 | Teeth much worn. |
| Mount Lololokwi | 182705 | ...do | 395 | 400 | 77 | 79 | 40 | 25.9 | 10.9 | 23.8 | 31.7 | 7.8 | 34.9 | Teeth moderately worn. |
| Mount Kenia | 164143 | ...do | 485 | 400 | 78 | 85 | 42 | 26.3 | 11.8 | 26.5 | 33.2 | 8.1 | 36.8 | Do. |
| Do | 164144 | ...do | 465 | 406 | 80 | 84 | 44 | 26.7 | 12.0 | 25.6 | 32.7 | 7.5 | 35.8 | Do. |
| Do | 164148 | ...do | 445 | 380 | 89 | 88 | 48 | 29.8 | 13.6 | 26.8 | 33.5 | 7.8 | 36.9 | Do. |
| Do | 164149 | ...do | 444 | 422 | 87 | 83 | 40 | 27.0 | 11.3 | 25.5 | 33.1 | 7.6 | 35.5 | Teeth unworn. |
| Do | 164145 | Female | 447 | 390 | 82 | 84 | 46 | 27.7 | 13.2 | 24.7 | 32.1 | 7.8 | 35.1 | Teeth moderately worn. |
| Do | 164147 | ...do | 427 | 383 | 78 | 81 | 42 | 26.5 | 11.2 | 24.0 | 32.2 | 7.4 | 34.8 | Do. |
| G. E. A.: | | | | | | | | | | | | | | |
| Mount Kilimanjaro | 38254 | ...do | ..... | ..... | ..... | 85 | 45 | 27.4 | 12.6 | 26.0 | 32.2 | 7.8 | 35.6 | Do. |
| Do | 38255 | ...do | ..... | ..... | ..... | 86 | 44 | 27.5 | 12.6 | 26.5 | 33.1 | 8.1 | 36.4 | Do. |
| Do | 38256 | ...do | ..... | ..... | ..... | ..... | ..... | ..... | 11.7 | 25.3 | 33.4 | 8.2 | 35.4 | Teeth unworn. |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *G. s. erlangeri.* | | | | | | | | | | | | | |
| B. E. A.: | | | | | | | | | | | | | |
| Mtoto Andei | 181545 | Male | 420 | 390 | 70 | 81 | 44 | 26.6 | 12.5 | 24.6 | 30.4 | 7.6 | 34.5 | Teeth moderately worn. |
| Do | 181548 | do | 420 | 410 | 78 | 82 | 45 | 20.7 | 12.1 | 24.5 | 32.1 | 8.3 | 35.5 | Teeth considerably worn. |
| Do | 181546 | Female | 440 | 400 | 76 | 83 | 42 | 26.7 | 11.7 | 25.0 | 33.0 | 8.4 | 35.9 | Teeth moderately worn. |
| Mount Mbololo | 182236 | Male | 450 | 390 | 78 | 88 | 46 | 27.9 | 12.6 | 26.9 | 35.0 | 7.7 | 37.6 | Do. |
| Do | 182237 | do | 435 | 375 | 68 | 83 | 42 | 26.9 | 12.9 | 26.0 | 33.1 | 8.5 | 36.1 | Teeth little worn. |
| Voi | 182706 | do | 440 | 425 | 76 | 84 | 43 | 27.7 | 13.3 | 26.6 | 32.0 | 7.1 | 35.0 | Teeth moderately worn. |
| Do | 182226 | Female | 420 | 380 | 73 | 80 | 40 | 24.9 | 11.4 | 25.0 | 31.2 | 7.4 | 34.2 | Teeth little worn. |
| Majl-ya-chumvi | 182264 | Male | 540 | 425 | 79 | 87 | 44 | 27.2 | 12.6 | 26.4 | 32.0 | 7.4 | 36.0 | Teeth moderately worn. |
| Do | 182265 | Female | 480 | 405 | 80 | ..... | 44 | ..... | 12.8 | 27.3 | 33.3 | 7.8 | 36.9 | Do. |
| Do | 182266 | do | 440 | 405 | 77 | 84 | 46 | 26.8 | 13.1 | 24.6 | 31.8 | 8.0 | 35.0 | Do. |
| Do | 182270 | do | 475 | 405 | 80 | 87 | 46 | 27.7 | 13.4 | 26.2 | 33.3 | 7.8 | 36.4 | Teeth much worn. |
| Marlakani | 182292 | Male | 500 | 430 | 85 | 91 | 48 | 28.6 | 13.2 | 27.7 | 34.3 | 8.5 | 38.3 | Teeth moderately worn. |
| Taveta | 35096 | ..... | ..... | ..... | ..... | 82 | 42 | 28.2 | 12.2 | 25.6 | ..... | 8.2 | ..... | Teeth unworn. |
| Do | 35097 | ..... | ..... | ..... | ..... | 88 | 44 | 28.6 | 12.4 | 26.8 | 32.8 | 7.7 | 35.7 | Teeth moderately worn. |
| Do | 35098 | ..... | ..... | ..... | ..... | 88 | 45 | 27.7 | 12.8 | 26.8 | 32.9 | 7.4 | 36.2 | Do. |
| *G. pumila.* | | | | | | | | | | | | | | |
| B. E. A.: Mount Gargues | [1] 182704 | Male | 380 | 355 | 76 | 75 | 38 | 24.6 | 10.0 | 23.3 | 29.5 | 7.0 | 32.6 | Do. |

[1] Type.

zygomatic breadth, 62.6, 56.1; interorbital breadth, 19.5, 18.3; postorbital breadth, 15.8, 14.6; mastoid breadth, 41.7, 38.1; lachrymal foramen to alveolar point, 35.7, 31.4; greatest length nasals, 27.3, 26.1; upper tooth row, including canine, 37.2, 34.1; upper carnassial, 7.6 × 5.4, 7.4 × 5.2; length of mandible, 75.4, 70.6; lower tooth row, including canine, 41, 37.9.

### Genus MUNGOS Geoffroy and Cuvier.

1795. *Mungos* Geoffroy and Cuvier, Mag. Encycl., vol. 2, p. 187. (*M. mungo.*)
1799. *Ichneumon* Lacépède, Tab. Div., Ord. Gen. Mamm., p. 7. (*M. ichneumon.*)
1811. *Herpestes* Illiger, Prodr. Syst. Mamm. et Avium, pp. 135, 202. (*M. ichneumon.*)
1865. *Calogale* Gray, Proc. Zool. Soc. London, 1864, pp. 509, 560. (*M. nepalensis.*)
1865. *Galerella* Gray, Proc. Zool. Soc. London, 1864, pp. 509, 564. February. (*M. ochraceus.*)
1914. *Calogale* Matschie, Sitz.-ber. Ges. nat. Freunde Berlin, 1914, p. 438.

This genus, together with the succeeding genera of Viverridæ, are considered by Pocock to belong to a separate family which he calls the Mungotidæ.[1] Matschie (1914) considers the members of the "*gracilis*" group as forming a distinct genus, *Calogale*.

For measurements of specimens of mungooses see pages 128-129.

#### MUNGOS DENTIFER Heller.

Plate 32, figs. 1, 2, 3.

1913. *Mungos dentifer* Heller, Smithsonian Misc. Coll., vol. 61, No. 13, p. 10, September 16. (Maji-ya-chumvi, British East Africa: type in U. S. Nat. Mus.)

*Specimens.*—Two, as follows:

British East Africa: Maji-ya-chumvi, 2 (Heller).

This small mungoose of the *ochraceus-melanurus* group agrees with the Zanzibar Island species, *Mungos lasti*, in possessing small first lower premolars, a character which distinguishes these two forms from all their relatives so far as known.

#### MUNGOS SANGUINEUS PARVIPES Hollister.

Plate 32, figs. 4, 5, 6.

1916. *Mungos sanguineus parvipes* Hollister, Smithsonian Misc. Coll., vol. 66, No. 1, p. 5. February 10. (Kaimosi, Kavirondo, British East Africa: type in U. S. Nat. Mus.)

*Specimens.*—Two, from the following localities:

British East Africa: Kaimosi, 1 (Heller); Lukosa River, 1 (Heller).

This form is readily distinguished from its geographical neighbors by its small skull and short hind foot. The type-specimen from

[1] Ann. and Mag. Nat. Hist., ser. 8, vol. 17, p. 415, June, 1916; Proc. Zool. Soc. London, 1916, p. 349, June, 1916.

Kaimosi is in the black phase and the specimen from Lukosa River is colored much like the grizzled *Mungos sanguineus ibeæ*.

For measurements see page 128.

MUNGOS SANGUINEUS IBEÆ Wroughton.

1892. *Herpestes gracilis* True, Proc. U. S. Nat. Mus., vol. 15, p. 451. (Not of Rüppell.)

1907. *Mungos sanguineus ibeæ* Wroughton, Ann. and Mag. Nat. Hist., ser. 7, vol. 20, p. 118. August. (Fort Hall, British East Africa; type in British Museum.)

1910. *Mungos sanguienus ibeæ* Roosevelt, African Game Trails, Amer. ed. p. 473; London ed., p. 485. (Part.)

*Specimens.*—Nine, from the following localities:

British East Africa: Mtoto Andei, 1 (Heller); Plains east of Kilimanjaro, 1 (Abbott); Sir Alfred Pease's Farm, Kitanga, 2 (Mearns); Southern Guaso Nyiro River, 2 (Mearns, Loring); Ulukenia Hills, 2 (Loring); Voi, 1 (Heller).

A female collected by Mearns at Kitanga, May 8, was not pregnant; there were two pairs of mammæ. Abbott notes of the female taken east of Kilimanjaro in June that the mammæ contained milk.

The nine skins of this form are quite uniform in color, with the exception of one of the specimens from the Southern Guaso Nyiro River. This latter skin is much more yellowish, or pale ochraceous, than the average, and is particularly bright on the back, legs, and tail. The second specimen from the same locality is in all respects normal. There is very little tendency toward melanism; only a single skin, from Sir Alfred Pease's Farm, shows a definite blackish area along the back, and this is rather indistinct.

The mungoose described by Matschie as *Calogale maræ*[1] must be very close indeed to *ibeæ;* the type-locality, Ngare Mdusse (a southern tributary of the Mara River), is near the German East African boundary only a short distance south of our Guaso Nyiro locality. The *Calogale elegans*, of the same author,[2] from Fort Smith, near Nairobi, would seem to be the same form, also.

MUNGOS SANGUINEUS ORESTES Heller.

Plate 33.

1911. *Mungos sanguineus orestes* Heller, Smithsonian Misc. Coll., vol. 56, No. 17, p. 15. February 28. (West slope of Mount Kenia, altitude 8,500 feet; type in U. S. Nat. Mus.)

*Specimens.*—Seven, as follows:

British East Africa: West slope of Mount Kenia (Mearns, Loring).

Mearns records the color of the iris in this species as "yellow-brown." The Kenia race of *Mungos sanguineus* is a dark-colored subspecies. Of the seven skins at hand five are quite blackish, and

[1] Sitz.-ber. Ges. nat. Freunde Berlin, p. 453. December, 1914. [2] Idem, p. 456.

the remaining two are darker brown, less grayish, than any skin of *M. s. ibeæ* in the collection. The size and characters of the skull are as in *ibeæ*.

MUNGOS SANGUINEUS RENDILIS Lönnberg.

1912. *Mungos sanguineus rendilis* LÖNNBERG, Kungl. Sv. Vet. Akad. Handl., vol. 48, No. 5, p. 66. (Northern bank of Northern Guaso Nyiro River, below Chanler Falls, British East Africa; type in R. Nat. Hist. Mus., Stockholm.)

*Specimens.*—Four, from localities as follows:

BRITISH EAST AFRICA: Longaya Water, Marsabit Road, 1 (Heller); Merelle Water, Marsabit Road, 1 (Heller); Mount Gargues, 1 (Heller); Mount Lololokwi, 1 (Heller).

The stomach of the Mount Gargues specimen contained a green snake and a small bird.

The four skins from north of Mount Kenia are decidedly more pale buffy, less grayish, than the series from south of Kenia, representing true *ibeæ;* they are also much more finely vermiculated. The female skull of this form is proportionally much less in size, compared with male skulls, than in the related races of this mungoose.

For measurements of specimens see page 129.

MUNGOS ICHNEUMON FUNESTUS Osgood.

1892. *Herpestes caffer* TRUE, Proc. U. S. Nat. Mus., vol. 15, p. 452. (Not of Gmelin; specimen from Kilimanjaro.)

1910. *Mungos ichneumon funestus* OSGOOD, Field Mus., Zool. Ser., vol. 10, No. 3, p. 17. April. (Naivasha, British East Africa; type in Field Mus. Nat. Hist., Chicago.)

*Specimens.*—Three, from localities as follows:

BRITISH EAST AFRICA: Kaimosi, 1 (Heller); Nairobi, 1 (Heller).

GERMAN EAST AFRICA: Mount Kilimanjaro, 1 (Abbott).

Genus ATILAX Geoffroy and Cuvier.

1826. *Atilax* GEOFFROY and CUVIER, Hist. Nat. Mamm., vol. 5, livr. 54, p. [2]. (*A. paludinosus.*)

The water mungooses recently have been given formal generic distinction by Pocock in his paper On the External Characters of the Mongooses.[1]

For measurements of specimens see page 129.

ATILAX PALUDINOSUS ROBUSTUS (Gray).

1865. *Athylax robustus* GRAY, Proc. Zool. Soc. London, 1864, p. 558. (White Nile; type in British Museum.)

*Specimen.*—One, as follows:

BRITISH EAST AFRICA: Guas Ngishu Plateau (White).

This specimen of the water mungoose is clearly of a form distinct from the subspecies found in the Taita Hills and Kilimanjaro regions.

[1] Proc. Zool. Soc. London, p. 349. June, 1916.

On account of its large size, and in the absence of typical specimens of *robustus* from the White Nile, it is referred to that early described form. Although a younger animal than any of our specimens of *A. p. rubescens*, it has a larger skull, which is especially characterized by its general elongation and greatly inflated auditory bullæ.

The following notes were made on the type-specimen of *Atilax paludinosus robustus*, by Heller:

Type from "White Nile," no definite locality. Very old, skull with sutures all obliterated and teeth worn down flat. Skin much lighter colored than any other specimen in the collection. Measurements of type skull (condyles cut away; bullæ broken): Back of bullæ to incisors, 108; zygomatic width, 62.5; postorbital constriction, 17; width palate across $pm^4$, 37; condylo-incisive length of mandible, 83; upper tooth row to front of canine, 42.5; width of $m^2$, 6.3; width of $m^1$, 10.7; width of $m_2$, 4.5; length of $m_2$, 6.

ATILAX PALUDINOSUS RUBESCENS (Hollister).

Plate 34.

1892. *Herpestes galera* (Erxl.); var. *robustus* TRUE, Proc. U. S. Nat. Mus., vol. 15, p. 452. (Specimens from Kilimanjaro; not of Gray.)

1912. *Mungos paludinosus rubescens* HOLLISTER, Proc. Biol. Soc. Washington, vol. 25, p. 1. January 23. (Mt. Kilimanjaro at 4,000 feet, German East Africa; type in U. S. Nat. Mus.)

*Specimens.*—Four, from localities as follows:

BRITISH EAST AFRICA: Mount Mbololo, 1 (Heller); Voi, 1 (Heller.)

GERMAN EAST AFRICA: Mount Kilimanjaro, 2 (Abbott).

The specimen from Mount Mbololo, an adult female with nasal and basal sutures closed, agrees in all respects with the Kilimanjaro specimens and unquestionably represents the same form. The example from Voi, also an old adult female, differs from the type of *rubescens* in its much larger auditory bullæ and much more reddish coloration. It is considerably larger than the female skull from Mount Mbololo. The general shape of skull agrees better with *rubescens*, however, than with the Guas Ngishu skull I have referred to *robustus*, and although the specimen may represent a new race it seems unwise to name more forms of this species until suitable series of skulls have been assembled for study of individual and geographic variation, Color of skins is doubtless of little value in differentiating subspecies of this mungoose, and the shape and size of the auditory bullæ are unreliable characters to use in describing new forms unless good series of skulls prove their constancy.

Genus ICHNEUMIA Geoffroy.

1837. *Ichneumia* GEOFFROY, Ann. Sci. Nat., Paris., ser. 2, vol. 8, p. 251. (*I. albicauda.*)

Mr. Pocock has described[1] the external characters of the white-tailed mungoose and these, in addition to notable cranial and dental

[1] Proc. Zool. Soc. London, pp. 349-374. June, 1916.

*Measurements of specimens of Mungos, Atilax, and Ichneumia.*

| Form and locality. | No. | Sex. | Head and body. | Tail vertebrae. | Hind foot. | Skull: Condylobasal length. | Zygomatic breadth. | Mastoid breadth. | Postorbital constriction. | Breadth of rostrum over canines. | Mandible. | Maxillary tooth row. | Mandibular tooth row, without incisors. | Observations. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *M. dentifer.* | | | | | | | | | | | | | | |
| B. E. A.: Majl-ya-chumvi | 182731 | Male | 225 | 215 | 49 | ..... | ..... | 21.2 | ..... | 10.8 | 34.0 | 21.2 | 22.3 | Milk canines. |
| Do | 182732 | Female | 270 | 205 | 45 | 54.3 | 27.9 | 21.3 | 9.9 | 9.7 | 33.9 | 20.2 | 21.8 | Sutures all closed. |
| *M. s. parvipes.* | | | | | | | | | | | | | | |
| Kalmosi | 182739 | Male | 305 | 247 | 54 | 61.3 | 30.9 | 23.2 | 9.6 | 10.9 | 39.3 | 21.7 | 24.2 | Sutures all closed. |
| Lukosa River | 182740 | ...do | 310 | 272 | 54 | 61.7 | 31.2 | 22.7 | 10.0 | 10.4 | 38.7 | 21.7 | 23.6 | Do. |
| *M. s. ibex.* | | | | | | | | | | | | | | |
| South Guaso Nyiro | 162123 | Female | 351 | 303 | 64 | 64.2 | 32.9 | 24.4 | 9.9 | 11.6 | 40.5 | 22.7 | 25.5 | Sutures all closed. |
| Do | 162129 | ...do | 330 | 320 | 65 | ..... | 31.6 | 24.5 | 11.8 | 11.4 | 40.6 | 22.7 | 24.5 | Basal suture open. |
| Kitanga | 161906 | Male | 350 | 325 | 67 | 65.1 | 33.8 | 24.3 | 10.9 | 11.9 | 42.2 | 23.9 | 26.5 | Basal suture closed. |
| Do | 161907 | Female | 350 | 295 | 65 | 66.5 | 30.8 | 22.7 | 8.7 | 11.3 | 41.5 | 24.4 | 26.7 | Sutures all closed. |
| Ulukenia Hills | 164158 | ...do | 324 | 326 | 65 | 66.8 | 31.7 | 23.5 | 8.6 | 10.9 | 42.6 | 24.4 | 26.4 | Do. |
| Mtoto Andei | 181535 | Male | 330 | 303 | 58 | 63.7 | 33.8 | 24.2 | 10.8 | 12.1 | 40.2 | 22.9 | 25.2 | Do. |
| Voi | 182736 | ...do | 320 | 305 | 60 | 65.1 | 32.5 | 23.2 | 12.0 | 12.0 | 40.3 | 23.7 | 26.4 | Basal suture open. |
| East of Kilimanjaro | 18936 | Female | ..... | ..... | ..... | 64.8 | 31.9 | 23.3 | 9.0 | 11.0 | 41.3 | 24.0 | 26.2 | Sutures all closed. |
| *M. s. orestes.* | | | | | | | | | | | | | | |
| Mount Kenia | 164152 | Male | 300 | 282 | 65 | 64.9 | 34.3 | 24.2 | 10.8 | 12.4 | 41.5 | 24.6 | 27.3 | Sutures all closed. |
| Do | 164153 | ...do | 355 | 285 | 71 | 66.2 | 35.1 | 24.1 | 11.3 | 12.7 | 42.9 | 24.3 | 27.2 | Do. |
| Do | 164156 | ...do | 347 | 304 | 69 | 67.3 | 33.8 | 23.6 | 10.5 | 12.8 | 43.5 | 24.6 | 27.0 | Do. |
| Do | 164151 | Female | 333 | 300 | 64 | 64.8 | 30.3 | 23.6 | 11.3 | 11.2 | 39.8 | 23.4 | 25.7 | Nasal sutures open. |
| Do | 164154 | ...do | 336 | 277 | 62 | 63.5 | 31.9 | 22.9 | 9.2 | 11.4 | 38.3 | ..... | 24.8 | Sutures all closed. |
| Do | 164155 | ...do | 340 | 290 | 62 | 61.8 | 30.8 | 23.2 | 10.2 | 11.1 | 38.3 | 22.6 | 24.4 | Nasal sutures open. |
| Do | 164157 | ...do | 312 | 298 | 63 | 62.6 | 30.9 | 23.3 | 10.3 | 11.3 | 38.8 | 22.5 | 24.8 | Basal suture closed. |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *M. s. rendilis.* | | | | | | | | | | | | | | |
| Mount Gargues | 182735 | Male | 315 | 285 | 57 | 63.7 | 33.3 | 24.4 | 11.0 | 11.4 | 39.5 | 22.7 | 25.2 | Basal suture closed. |
| Mount Lololokwi | 184797 | ...do | | | | 64.5 | 32.0 | 23.4 | 11.6 | 11.7 | 39.7 | 23.4 | 26.1 | Sutures all closed. |
| Merelle Water | 182734 | ...do | 330 | 315 | 60 | 66.1 | 34.7 | 24.6 | 11.0 | 12.6 | 42.4 | 24.4 | 26.4 | Do. |
| Longaya Water | 182733 | Female | 285 | 280 | 55 | 59.6 | 29.6 | 22.3 | 9.1 | 10.9 | 37.4 | 21.8 | 24.0 | Do. |
| *A. p. robustus.* | | | | | | | | | | | | | | |
| Guas Ngishu Plateau | 173005 | Male | | | | 109 | | 42.2 | 15.4 | 23.5 | 74.7 | 39.4 | 45.1 | Nasal sutures open. |
| *A. p. rubescens.* | | | | | | | | | | | | | | |
| Mount Mbololo | 182238 | Female | 450 | 265 | 62 | 99 | 59 | 39.3 | 16.2 | 23.0 | 71.7 | 36.8 | 42.6 | Sutures all closed. |
| Voi | 182227 | ...do | 500 | 360 | 100 | 107 | 63 | 42.4 | 13.6 | 25.4 | 74.1 | 40.2 | 46.3 | Do. |
| G. E. A.: Mt. Kilimanjaro | [1] 35251 | Male | | | | 102 | 56 | 39.0 | 15.3 | 24.8 | 72.3 | 37.8 | 44.2 | Nasal sutures open. |
| *I. a. ibeana.* | | | | | | | | | | | | | | |
| B. E. A.: | | | | | | | | | | | | | | |
| Kisumu | 182346 | Female | 550 | | 120 | 110 | 56 | 37.5 | 23.3 | 21.2 | 77.4 | 43.0 | 47.8 | Sutures all closed. |
| Naivasha | 162130 | Male | 575 | 455 | 133 | 106 | 53 | 38.0 | 21.9 | 21.2 | 74.4 | 40.6 | 45.8 | Basal and nasal sutures open. |
| Do | 162133 | Female | 567 | 495 | 128 | | 55 | | 23.6 | 24.5 | 78.8 | 43.8 | 48.0 | Teeth considerably worn. |
| Nairobi | 182728 | Male | | | | | 53 | | 24.0 | 20.5 | | 41.5 | | Nasal sutures open. |
| Athi Plains | 182729 | Female | | | | 102 | | 37.4 | 24.8 | 20.4 | 70.3 | 40.2 | 45.2 | Basal and nasal sutures open. |
| Ulukenia Hills | 164572 | | | | | 109 | 55 | 37.6 | 21.8 | 22.2 | 76.2 | 42.3 | 47.8 | Basal suture closed. |
| Kapiti Plains | 162134 | | | | | 98 | 48 | 36.8 | 23.0 | 20.2 | 69.1 | | | Basal and nasal sutures open. |
| Mtoto Andei | 181536 | Female | 450 | 550 | 115 | 105 | 54 | 37.4 | 21.4 | 21.9 | 74.3 | 40.8 | 45.4 | Sutures all closed. |
| Voi | 182225 | ...do | 530 | | 110 | 105 | 53 | 35.4 | 20.0 | 20.5 | 73.7 | 42.8 | 47.4 | Do. |
| Do | 182257 | ...do | 470 | 395 | 115 | 100 | 50 | 36.0 | 22.6 | 20.7 | 70.0 | 39.7 | 44.8 | Basal and nasal sutures open. |
| Maji-ya-chumvi | 182263 | ...do | 525 | 435 | 118 | 99 | 50 | 36.3 | 20.1 | 19.8 | 69.2 | 39.2 | 42.5 | Sutures all closed. |
| Melinda | 182730 | ...do | 525 | 435 | 106 | 101 | 50 | 36.5 | 22.2 | 20.3 | 70.0 | 39.5 | 40.0 | Basal and nasal sutures open. |
| Changamwe | [2] 163294 | ...do | 560 | 440 | 125 | 110 | 52 | 38.2 | 22.2 | 22.2 | 78.7 | 44.6 | 48.2 | Basal suture closed; teeth much worn. |
| *I. a. dialeucos.* | | | | | | | | | | | | | | |
| Mount Lololokwi | [1] 184794 | Male | | | | 104 | 54 | 37.1 | 20.2 | 20.3 | 69.5 | 39.8 | 44.8 | Sutures all closed. |
| Do | 184796 | ...do | | | | 104 | 53 | 37.3 | 21.2 | 20.8 | 73.4 | 40.8 | 45.8 | Basal suture closed. |

[1] Type.

[2] Type of "*Mungos albicaudus ferox.*"

differences long known, seem of sufficient importance to warrant recognition of a special genus for the animals.

For measurements of specimens see page 129.

### ICHNEUMIA ALBICAUDA IBEANA (Thomas).

Plate 35.

1904. *H[erpestes] a[lbicaudus] ibeanus* THOMAS, Ann. and Mag. Nat. Hist., ser. 7, vol. 13, p. 409. June. (Athi-ya-Maui,[1] Mombasa-Uganda Railway, British East Africa; type in British Museum.)

1910. *Mungos albicaudus ibeanus* ROOSEVELT, African Game Trails, Amer. ed., p. 473; London ed., p. 485.

1913. *Mungos albicaudus ferox* HELLER, Smithsonian Misc. Coll., vol. 61, No. 13, p. 11. September 16. (Changamwe, British East Africa; type in U. S. Nat. Mus.)

*Specimens.*—Eighteen, from localities as follows:

BRITISH EAST AFRICA: Athi Plains, 1 (Klein); Changamwe, 1 (Mearns); Kapiti Plains, 1 skull only (Loring); Kisumu, 1 (Heller); Lukosa River, 1 (Heller); Maji-ya-chumvi, 1 (Heller); Mazeras, 1 (Heller); Melindi, 1 (Hinde); Mtoto Andei, 1 (Heller); Nairobi, 1 (Klein); Naivasha, 3 (Mearns, Loring, Heller); Ulukenia Hills, 2 (Loring); Voi, 3 (Heller).

Heller has recorded the stomach contents of specimens collected by himself as follows: Lukosa River, small cobra and large beetles; Kisumu, large beetles; Voi, one with large beetles, one with termites, and one termites and rodents. Mearns records the weight of an adult male [basal and nasal sutures still open] from Naivasha as ten pounds, and the color of the irides of the Changamwe specimen as "light hazel."

The excellent series listed above shows the marked uniformity of color, except for cases of melanism, which obtains in this form throughout its range in British East Africa. Eliminating specimens with black tails the remaining skins, from Kavirondo to the coast, are very evenly colored, and are easily distinguished from the silvery form found in the region above the Northern Guaso Nyiro. The type-specimen of Heller's *Mungos albicaudus ferox* from Changamwe, near the coast, is in such a ragged state of pelage that any comparison with skins from other localities is valueless. A skin in much better condition from Mazeras is, however, colored quite as are skins from near the type-locality of *ibeana*, and I can find no other characters by which to recognize the coast form. The skull of the type of *ferox* is somewhat smaller than some female skulls of *ibeana*, and the teeth are so much worn that no intelligent comparisons are possible, so that the characters of "larger size" and larger lower molar can hardly be accepted without more material from the Mombasa region. The skin from Melinda, on the coast north of Mombasa, is the darkest in the series, but is evidently melanistic.

[1] Mr. Heller thinks this is no doubt the Swahili name for Stony Athi station, as *maui* in Swahili="stony."

The following very interesting account of a white-tailed mungoose and a snake was told to Colonel Roosevelt by Mr. Leslie Tarlton in Africa:

The mongoose was an inmate of the house where he [Tarlton] dwelt with his brother and was quite tame. One day they brought in a rather small puff adder, less than two feet long, put it on the floor, and showed it to the mongoose. Instantly the latter sprang toward the snake, every hair in its body and tail on end, and halted five feet away, while the snake lay in curves like the thong of a whip, its head turned toward the mongoose. Both were motionless for a moment. Then suddenly the mongoose seemed to lose all its excitement; its hair smoothed down; and it trotted quietly up to the snake, seized it by the middle of the back—it always devoured its food with savage voracity—and settled comfortably down to its meal. Like lightning the snake's head whipped round. It drove its fangs deep into the snout or lip of the mongoose, hung on for a moment, and then repeated the blow. The mongoose paid not the least attention, but went on munching the snake's body, severed its backbone at once, and then ate it all up, head, fangs, poison, and everything; and it never showed a sign of having received any damage in the encounter.[1]

ICHNEUMIA ALBICAUDA DIALEUCOS (Hollister).

Plate 36, figs. 5, 6.

1916. *Mungos albicaudus dialeucos* HOLLISTER, Smithsonian Misc. Coll., vol. 66, No. 1, p. 6. February 10. (Mount Lololokwi, British East Africa; type in U. S. Nat. Mus.)

*Specimens.*—Four, from the following localities:

BRITISH EAST AFRICA: Merelle Water, Marsabit Road, 1 (Heller); Mount Lololokwi, 3 (Heller).

This color subspecies is related to *Ichneumia albicauda ibeana* rather than to the more northern *I. a. leucura*. It has the larger teeth of the common British East African form, and is distinguished only by its more silvery, less buffy, coloration. The four skins in the collection are very much alike and show no conspicuous variation in color; all have clear white tails.

Genus HELOGALE Gray.

1862. *Helogale* GRAY, Proc. Zool. Soc. London, 1861, p. 308. April. (*H. parvula.*)

Several subspecies of the lesser mungoose occur in eastern Equatorial Africa. The four forms represented in our collection can be referred to two distinct species, which in the present unrevised condition of the genus may be called *undulata* Peters and *hirtula* Thomas. A careful revision of the forms of the genus, based upon all the available material in different museums, is greatly needed. There is evidently an unusual amount of geographic variation in these animals.

For measurements of specimens of *Helogale* see table, page 133.

[1] African Game Trails, pp. 290, 291. 1910.

#### HELOGALE UNDULATA AFFINIS Hollister.

Plate 36, figs. 1, 2, 3, 4.

1916. *Helogale undulata affinis* Hollister, Smithsonian Misc. Coll., vol. 66, No. 1, p. 7. February 10. (Mount Lololokwi, British East Africa; type in U. S. Nat. Mus.)

*Specimens.*—Six, as follows:

British East Africa: Mount Lololokwi, summit at 6,000 feet, 2 (Heller); Rumathe Water, Northern Guaso Nyiro, 4 (Heller).

The specimens from Northern Guaso Nyiro have slightly darker tails and more heavily speckled feet than the type and topotype skins from the summit of Mount Lololokwi. According to Heller's field notes these animals go in troups of a dozen or more and make a peculiar rustling noise as they move through the leaves and brush. They also keep up a chirping to each other. He shot an old male which was chirping loudly at him from a rock. At Rumathe Water he saw several troups which took refuge when frightened in the funnels of termite hills. The four taken at this place were shot by waiting at the termite hills until they appeared after their fright.

#### HELOGALE UNDULATA RUFULA Thomas.

1892. *Helogale undulata* True, Proc. U. S. Nat. Mus., vol. 15, p. 451. (Specimens from Kilimanjaro region; not of Peters.)

1910. *Helogale undulata rufula* Thomas, Ann. and Mag. Nat. Hist., ser. 8, vol. 5, p. 194. February. (Rogoro, Kikuyu, British East Africa; type in British Museum.)

*Specimens.*—Three, from localities as follows:

British East Africa: Kijabe, 1 (Heller); Plains east of Kilimanjaro, 1 (Abbott); Taveta, 1 (Abbott).

The Kilimanjaro specimens collected by Doctor Abbott agree in most details with the Kijabe specimen, which must be assumed to represent typical *rufula*. They are, however, slightly brighter colored and the skulls are relatively a little broader. They are decidedly different in coloration from the Mazeras specimens which I have for the present referred to *Helogale undulata atkinsoni* Thomas, and in all points of difference agree better with the Kijabe specimen of *rufula* referred to above.

#### HELOGALE UNDULATA ATKINSONI Thomas.

1897. *Helogale atkinsoni* Thomas, Ann. and Mag. Nat. Hist., ser. 6, vol. 20, p. 378. (Hargaisa, Somaliland; type in British Museum.)

*Specimens.*—Three, as follows:

British East Africa: Mazeras (Heller).

It is with considerable doubt that I refer these three skins to *Helogale undulata atkinsoni*. They differ in many respects from specimens of other British East African races of *undulata* (*rufula* and *affinis*) and have the decidedly shorter tail of true *atkinsoni*. They probably represent an undescribed subspecies, nearer to *atkinsoni*

*Measurements of specimens of Helogale from British East Africa.*

| Form and locality. | No. | Sex. | Head and body. | Tail vertebræ. | Hind foot. | Skull: Condylobasal length. | Zygomatic breadth. | Mastoid breadth. | Postorbital constriction. | Breadth of rostrum over canine. | Mandible. | Maxillary tooth row. | Mandibular row, without incisors. | Observations. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *H. u. affinis.* | | | | | | | | | | | | | | |
| Mount Lololokwi | [1] 182715 | Male | 220 | 175 | 46 | 49.7 | 29.6 | 22.8 | 9.2 | 9.5 | 33.8 | 16.5 | ..... | Basal and nasal sutures closed. |
| N. Guaso Nyiro | 182717 | do | 225 | 184 | 45 | ..... | 29.1 | ..... | 10.0 | 11.3 | 33.1 | 16.7 | 19.6 | Nasal sutures open. |
| Do | 182719 | do | 205 | 170 | 46 | 48.0 | ..... | ..... | 10.7 | 9.5 | ..... | 16.0 | 18.8 | Basal and nasal sutures open. |
| Do | 182720 | do | 225 | 180 | 45 | 50.7 | 28.7 | 23.3 | 8.8 | 10.5 | 33.3 | 16.7 | 19.3 | Basal sutures closed. |
| Do | 182718 | Female | 10 | 173 | 42 | 48.0 | 28.9 | 22.4 | 9.4 | 10.5 | 33.4 | 16.5 | 19.6 | Basal and nasal sutures closed. |
| *H. u. rufula.* | | | | | | | | | | | | | | |
| Kijabe | 181781 | Male | 240 | 175 | 48 | 52.2 | 30.7 | 23.8 | 8.6 | 10.9 | 35.1 | 17.3 | 20.2 | Basal suture closed. |
| Taveta | 35095 | Female | ..... | ..... | ..... | 46.4 | 30.6 | 22.8 | 10.2 | 10.2 | 32.1 | 16.6 | 18.7 | Basal and nasal sutures closed. |
| E. of Kilimanjaro | 35094 | do | ..... | ..... | ..... | 45.7 | 25.7 | 20.5 | 11.2 | 9.2 | 30.0 | 16.4 | 19.2 | Sutures all open. |
| *H. u. atkinsoni.* | | | | | | | | | | | | | | |
| Mazeras | 182721 | Female | 215 | 150 | 45 | 47.7 | 27.1 | 22.3 | 11.0 | 11.0 | 31.0 | 17.0 | 19.9 | Sutures all open. |
| Do | 182722 | do | 240 | 157 | 44 | 48.8 | 28.7 | 22.9 | 11.2 | 11.0 | 32.4 | 17.1 | 19.7 | Do. |
| Do | 182723 | do | 245 | 145 | 46 | 50.8 | 29.9 | 23.1 | 9.8 | 11.2 | 33.7 | 17.6 | 20.3 | Basal suture closed. |
| *H. u. ahlselli.* | | | | | | | | | | | | | | |
| Merelle Water | 182713 | Male | 240 | 211 | 48 | 52.0 | 31.0 | 24.4 | 10.8 | 11.3 | 31.5 | 18.2 | 20.7 | Basal and nasal sutures closed. |
| Do | 182712 | Female | 235 | 194 | 49 | 50.2 | 31.2 | 23.9 | 10.2 | 11.0 | 34.3 | 18.5 | 20.6 | Do. |
| Koya Water | 182714 | Male | 256 | 205 | 50 | 49.6 | 29.2 | 22.2 | 10.3 | 10.4 | 33.9 | 17.0 | 19.8 | Nasal sutures open. |

[1] Type.

than to *rufula*, but until the forms of the group are better known it is certainly better to consider them as *atkinsoni* than to name another closely related subspecies on such limited material. The three specimens were compared by Heller in London and he has made the following note:

Mazeras specimens almost identical to type [of *atkinsoni*], perhaps a shade more rufous; also very close in color to *rufula*, but slightly lighter and with decidedly shorter tails. Skull with slightly larger teeth than *atkinsoni*.

The following notes made by Heller in Berlin on the type-specimen of *Helogale undulata* (Peters) are also of great interest in this connection:

*Helogale undulata* (Peters). Type 1127, Mossambique (W. Peters). Skin mounted; skull perfect, adult. Color: Light buffy-tipped hairs, ground color mummy brown, not reddish like British East African specimens. Skull: Condyloincisive length, 48; zygomatic breadth, 28; interorbital breadth, 10; postorbital breadth, 10; tooth row, including canine, 16.2; length of mandible, 32. Nasal sutures closed.

HELOGALE HIRTULA AHLSELLI Lönnberg.

1912. *Helogale hirtula ahlselli* Lönnberg, Ann. and Mag. Nat. Hist., ser. 8, vol. 9, p. 64. January. (Thornbush country on the northern side of Northern Guaso Nyiro River, British East Africa; type in R. Nat. Hist. Museum, Stockholm.)

*Specimens.*—Five, as follows:

British East Africa: Kara River, Marsabit Road, 1 (Heller); Koya Water, Marsabit Road, 1 (Heller); Lakiundu River, Northern Guaso Nyiro, 1 (Heller); Merelle River, Marsabit Road, 2 (Heller).

This form must be very close indeed to *Helogale hirtula lutescens* Thomas[1] from the northern end of Lake Rudolf; no specimens of typical *lutescens* are available for comparison, but *ahlselli* is evidently a somewhat brighter colored subspecies, with more ochraceous colored lower back and rump.

Like the members of the *undulata* group, these animals go in packs. Heller saw one pack of six near the Lakiundu River which escaped in *Tatera* holes. Again this same pack took refuge in a termite nest. Heller's notes say: "They move about in small packs like the *Crossarchus* and have no permanent burrows."

Genus BDEOGALE Peters.

1852. *Bdeogale* Peters, Mon.-ber. K. Preuss. Akad. Wiss., Berlin, p. 81. (*B. crassicauda.*)

1894. *Galeriscus* Thomas, Ann. and Mag. Nat. Hist., ser. 6, vol. 13, p. 522. June. (*B. jacksoni.*)

Specimens of this genus are rather rare in collections. The animals are evidently not common in British East Africa, as no specimens were secured by the Smithsonian African Expedition. The two species sent in from the Rainey Expedition are widely different in color and represent two distinct groups.

[1] Ann. and Mag. Nat. Hist., ser. 8, vol. 8, p. 725, December, 1911.

BDEOGALE JACKSONI (Thomas).

1894. *Galeriscus jacksoni* THOMAS, Ann. and Mag. Nat. Hist., ser. 6, vol. 13, p. 523. June. (Mianzini, British East Africa; type in British Museum.)

*Specimens.*—Two, as follows:

BRITISH EAST AFRICA: Lukosa River (Heller).

These specimens are skins, without skulls, and were purchased from Nandi natives. The form will most surely prove to be a geographic subspecies of *Bdeogale nigripes* Pucheran, of West Africa.

Matschie, as early as 1895,[1] called attention to the fact that "*Galeriscus*" *jacksoni* is in reality a *Bdeogale*. This was overlooked by Pocock in his note on *Galeriscus*, 1916.[2]

BDEOGALE CRASSICAUDA OMNIVORA Heller.

Plate 34.

1913. *Bdeogale crassicauda omnivora* HELLER, Smithsonian Misc. Coll., vol. 61, No. 13, p. 12. September 16. (Mazeras, British East Africa; type in U. S. Nat. Mus.)

*Specimens.*—Four, including one large fetus, as follows:

BRITISH EAST AFRICA: Mazeras (Heller).

The stomach of the type-specimen, collected December 21, contained beetles and mice. There was a large embryo which is preserved in alcohol. A second female taken the same week was nursing a quarter-grown young one, which also is in the collection. In the original description of this race the feet are described as black; they are in reality dark brown, and are far from black in color.

The type and adult topotype, both females, with basal and nasal sutures of the skull entirely closed, measure as follows: Head and body, 420, 400; tail vertebræ, 245, 250; hind foot, 81, 80; ear, 34, 37. Skulls: Condylobasal length, 84.6, 84.5; zygomatic breadth, 45.4, 44.6; mastoid breadth, 32.9, 31.9; postorbital constriction, 14.2, 13.4; interorbital breadth, 17.8, 17.6; lachrymal foramen to alveolar point, 30.3, 29.8; breadth of rostrum over canine, 19.4, 19.2; length of mandible, 58.5, 57.4; maxillary tooth row, including canine, 30.9, 31.0; mandibular row, including canine, 35.3, 34.2.

No specimens of the related forms are in the collection. The following manuscript notes on the type-specimens of *Bdeogale crassicauda* Peters and *Bdeogale puisa* Peters were made by Heller at the Berlin Museum, and are published here for preservation:

*Bdeogale crassicauda* Peters. Type 1151, old adult ♀, molars worn and sutures ankylosed; skin mounted and faded. Tette (coll. W. Peters). Upperparts annulated black and grayish-white, much like *Mungos albicaudus*; tail dark seal-brown, underfur grayish-buff or whitish; feet seal brown. Skull: Condyloincisive length, 85; zygomatic breadth, 45; interorbital breadth, 17.5; postorbital breadth, 15; upper tooth row with canine, 30.5; width of $m^2$, 7.1; length of mandible, 60.

[1] Die Säugethiere Deutsch-Ost-Afrikas, p. 147. 1895.

[2] Ann. and Mag. Nat. Hist., ser. 8, vol. 17, p. 179. February, 1916.

*Bdeogale puisa* Peters. Type, 1150, ♂, Querimba; Peters coll., skin mounted, faded. Skull with top of braincase sawed off and lost. Very old, teeth worn away to alveoli and last upper molars gone; points of canines much worn. Color: Body above annulated buffy and umber-brown; tail black, hair brown at base; legs seal-brown. Skull: Condyloincisive length, 93; zygomatic breadth, 54; interorbital breadth, 21; postorbital breadth, 15.5; length of mandible, 66; upper tooth row with canine, 31; width of $m^2$, 8.

### Genus CROSSARCHUS Geoffroy and Cuvier.

1825. *Crossarchus* Geoffroy and Cuvier, Hist. Nat. Mamm., vol. 5, livr. 47, text "le Mangue," p. 3. February. (*C. obscurus.*)

1865. *Ariela* Gray, Proc. Zool. Soc. London, 1864, pp. 509, 565. February. (*C. fasciatus.*)

The banded mungoose is represented in our East African collections by one form only. A much darker, richer colored race, more like the South African forms, is found in Uganda; and other species occur in Abyssinia, Somali, and Sudan. Mr. Pocock has recently recognized the genus *Ariela* as distinct from *Crossarchus*.[1]

#### CROSSARCHUS FASCIATUS COLONUS Heller.

Plate 37, figs. 1, 2; plate 38, figs. 1, 2.

1892. *Crossarchus mungo* True, Proc. U. S. Nat. Mus., vol. 15, p. 453. (Specimen from Taveta; not of Gmelin.)

1910. *Crossarchus fasciatus macrurus* Roosevelt, African Game Trails, Amer. ed., p. 473; London ed., p. 485. (Not of Thomas.)

1911. *Crossarchus fasciatus colonus* Heller, Smithsonian Misc. Coll., vol. 56, No. 17, p. 16. February 28. (Southern Guaso Nyiro River, British East Africa; type in U. S. Nat. Mus.)

*Specimens.*—Twelve, from localities as follows:

British East Africa: Kabalolot Hill, Sotik, 4 (Heller); Loita Plains, 2 (Heller); Southern Guaso Nyiro River, 5 (Heller, Mearns, Loring); Taveta, 1 (Abbott).

The specimen from Taveta is in all essential details like the specimens from the Southern Guaso Nyiro and Sotik. There is considerable variation among the skins from the type region, some showing much more reddish-brown in the lower back than others.

These mungooses are often met with on the grassy plains of the Sotik country, where they live in colonies in burrows on the open veldt. They do not stop long in any locality, but move about in small packs of ten to twenty individuals, which take up a temporary abode in any nest of burrows which they find convenient. From our observations it was apparent that they do not remain more than a day or two in any one set of burrows.[2]

Doctor Mearns records the color of the iris of an adult female as "yellowish-brown."

For measurements see page 137.

[1] Pocock, Proc. Zool. Soc. London, 1916, p. 349. June, 1916.

[2] Heller, Smithsonian Misc. Coll., vol. 56, No. 17, p. 16. February 28, 1911.

*Measurements of specimens of Crossarchus fasciatus colonus.*

| Locality. | No. | Sex. | Head and body. | Tail vertebræ. | Hind foot. | Skull: Condylobasal length. | Zygomatic breadth. | Mastoid breadth. | Postorbital constriction. | Breadth of rostrum over canines. | Mandible. | Maxillary tooth row. | Mandibular row, without incisors. | Observations. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| So. Guaso Nyiro | 181537 | Male | 400 | 295 | 82 | 77 | 40.2 | ..... | 13.7 | 15.3 | 51.6 | 27.3 | 30.3 | Basal and nasal sutures open. |
| Do | 181538 | do | 400 | 275 | 83 | 78 | 41.7 | 31.3 | 14.0 | 15.1 | 52.8 | 27.5 | 32.0 | Do. |
| Do | 162131 | Female | 350 | 300 | 91 | ..... | 39.1 | ..... | 14.2 | 14.2 | 50.6 | 25.8 | 29.8 | Do. |
| Do | [1] 162132 | do | 380 | 260 | 92 | 76 | 42.5 | 32.2 | 13.2 | 15.4 | 52.8 | 27.4 | 30.2 | Basal and nasal sutures closed. |
| Kabalolot Hill, Sotik | 181541 | Male | 390 | 260 | 83 | 76 | 40.5 | 31.6 | 12.7 | 15.5 | 52.0 | 26.6 | 30.8 | Basal and nasal sutures open. |
| Do | 181542 | do | 380 | 257 | 83 | 75 | 39.8 | 31.4 | 14.1 | 15.2 | 51.3 | 26.8 | 30.2 | Do. |
| Do | 181543 | do | 365 | 260 | 80 | 74 | 37.1 | 29.9 | 12.8 | 14.1 | 49.9 | 25.5 | 29.6 | Do. |
| Do | 181544 | Female | 390 | 260 | 80 | 76 | 42.3 | 31.4 | 12.3 | 15.9 | 53.5 | 27.8 | 31.4 | Basal and nasal sutures closed. |
| Loita Plains | 181539 | Male | 415 | 295 | 83 | 78 | 42.4 | 32.9 | 11.2 | 16.5 | 54.8 | 28.5 | 32.2 | Do. |
| Do | 181540 | Female | 380 | 255 | 79 | 75 | 42.4 | 31.6 | 14.1 | 15.2 | 52.2 | 26.7 | 31.0 | Do. |
| Taveta | 34685 | do | ..... | ..... | ..... | 75 | 40.1 | 31.5 | 12.7 | 15.3 | 50.4 | 26.8 | 30.2 | Do. |

[1] Type.

## Family PROTELIDÆ.

### Genus PROTELES Geoffroy.

1824. *Proteles* GEOFFROY, Mem. Mus. Hist. Nat., Paris, vol. 11, p. 355. (*P. cristatus.*)

In addition to the subspecies of the aard-wolf listed below, others have been described from Somaliland (*Proteles cristatus septentrionalis* Rothschild)[1] and from Nubia (*P. c. pallidior* Cabrera).[2]

#### PROTELES CRISTATUS TERMES Heller.

Plate 37, fig. 3; plate 38, fig. 3.

1910. *Proteles cristatus septentrionalis* ROOSEVELT, African Game Trails, Amer. ed., p. 473; London ed., p. 485. (Not of Rothschild.)

1913. *Proteles cristatus termes* HELLER, Smithsonian Misc. Coll., vol. 61, No. 13, p. 9. September 16. (Kabalolot Hill, headwaters of the Amala River, west of the Loita Plains, British East Africa; type in U. S. Nat. Mus.)

*Specimens.*—Four, from the following localities:

BRITISH EAST AFRICA: Kabalolot Hill, Sotik, 1 (Heller); Northern Guaso Nyiro River, near Neuman's Boma, 1 (K. Roosevelt); Telek River, Sotik, 1 (Johnston); Ulukenia Hills, 1 (Loring).

Heller records the stomach contents of the type-specimen as a "mass of termites." In the original description of *termes* he refers the specimen from Northern Guaso Nyiro to this race with the remarks that it is "much more fulvous than those from the higher plateau of the Loita" and also notes that "in the lack of grayish coloration and the suppression of the black areas this form approaches the Somaliland race."[3]

For measurements see table.

*Measurements of specimens of Proteles cristatus termes from British East Africa.*

| Locality. | No. | Sex. | Head and body. | Tail vertebræ. | Hind foot. | Skull: Condylobasal length. | Zygomatic breadth. | Mastoid breadth. | Postorbital constriction. | Breadth of rostrum over canine. | Lachrymal foramen to alveolar point. | Greatest length of nasals. | Length of mandible. | Observations. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| No. Guaso Nyiro River | 164508 | Male | ..... | ..... | ..... | 140 | 82 | 55 | 35.8 | 39 | 54.8 | 46 | 98 | Basal suture closed. |
| Telek River | 181495 | ...do.... | 623 | 260 | 148 | 127 | 72 | 49 | 33.5 | 37 | 46.7 | 38 | 89 | Basal suture open. |
| Ulukenia Hills | 164337 | Female | 682 | 251 | 141 | 135 | 88 | 53 | 34.8 | 42 | 49.7 | 44 | 97 | Basal suture closed. |
| Kabalolot Hill | [1]181523 | ...do.... | 680 | 310 | 142 | 136 | 74 | 48 | 34.2 | 37 | 54.4 | 43 | 96 | Basal suture open. |

[1] Type.

[1] Nov. Zool., vol. 9, p. 443. 1902.

[2] Ann. and Mag. Nat. Hist., ser. 8, vol. 6, p. 464. 1910.

[3] Smithsonian Misc. Coll., vol. 61, No. 13, p. 9. September 16, 1913.

## Family HYÆNIDÆ.

### Genus HYÆNA Brisson.

1762. *Hyæna* Brisson, Regn. Anim., ed. 2, p. 13. (*H. hyæna.*)
1868. *Euhyæna* Falconer, Pal. Mem., vol. 2, p. 464. (*H. hyæna.*)

The striped hyena is rare in the southern parts of British East Africa, but is much more common north of Mount Kenia, where a good series of specimens was obtained by the Rainey Expedition.

For measurements see tables, pages 141–142.

#### HYÆNA HYÆNA SCHILLINGSI Matschie.

Plate 2.

1900. *Hyæna* (*Hyæna*) *schillingsi* Matschie, Sitz.-ber. Ges. nat. Freunde Berlin, p. 55. (West Njiri Swamp,[1] Massai Plains, German East Africa; type in Berlin Museum.)
1910. *Hyæna striata schillingsi* Roosevelt, African Game Trails, Amer. ed., p. 473; London ed., p. 485.
1914. *Hyæna hyæna schillingsi* Roosevelt and Heller, Life-Hist. African Game Anim., vol. 1, p. 254.

*Specimens.*—Two, as follows:

British East Africa: Olarakeri, Sotik (Heller).

Of the above specimens, one is an old female and one a young male. The adult skin has been mounted for the exhibition series (plate 2, upper figure). This species is evidently much more uncommon in the Sotik than is the larger spotted hyena, as these two specimens were the only ones collected by the Smithsonian African Expedition, while good series of the spotted species were obtained.

#### HYÆNA HYÆNA BERGERI Matschie.

Plate 3.

1910. *Hyæna* (*Hyæna*) *hienomelas bergeri* Matschie, Sitz.-ber. Ges. nat. Freunde Berlin, p. 361. (Elgeyo Escarpment, east of Sirgoi, British East Africa; type in Berlin Museum.)
1912. *Hyæna schillingsi rendilis* Lönnberg, Ann. and Mag. Nat. Hist., ser. 8, vol. 9, p. 64. January. (Thorn-bush country north of Northern Guaso Nyiro, British East Africa; type in R. Nat. Hist. Mus., Stockholm.)
1914. *Hyæna hyæna bergeri* Roosevelt and Heller, Life-Hist. African Game Anim., vol. 1, p. 255.

*Specimens.*—Eleven, from the following localities:

British East Africa: Archer's Post, Northern Guaso Nyiro, 3 (Heller); Lakiundu River, 4 (Heller); Merelle Water, Marsabit Road, 4 (Heller).

I have seen no specimens of this hyena from the type region, our material all coming from the eastward, near the type locality of Doctor Lönnberg's *rendilis*. Heller gives the range of *bergeri* as the "desert region of British East Africa from the southern slopes of

[1] Matschie, Sitz.-ber. Ges. nat. Freunde Berlin, 1910, p. 369.

Mount Kenia and the Mau Escarpment northward through the Lake Rudolf basin, southern Abyssinia, and Somaliland." [1] Matschie's type-locality is therefore near the extreme southwestern limits of distribution, and it seems more than probable that Heller is correct in placing Lönnberg's *rendilis* in synonymy. No striped hyenas are known from the Guas Ngishu country, westward from the type locality of *bergeri*.

HYÆNA DUBIA Schinz.

Plate 3.

1825. *Hyæna dubia* Schinz, Das Thierreich von Cuvier, vol. 4, p. 509. (Dongola, Sudan; "Frankfurter Museum.")

1900. *H[yæna] hienomelas* Matschie, Sitz.-ber. Ges. nat. Freunde Berlin, No. 1, p. 53. January. (Teawa, Atbara, Sudan; based on Latreille, "Sonnini's Suites de Buffon," vol. 27, p. 25.)

1914. *Hyæna hienomelas* G. M. Allen, Bull. Mus. Comp. Zoology, vol. 58, No. 7, p. 341. July.

*Specimens.*—Two, from the following localities:

Eritrea: "Habesch," 1 (Schrader).

British Somali: Berbera, 1 (Swayne).

Through the kindness of the authorities at the Museum of Comparative Zoölogy I have been able to borrow for study in this connection the skin and skull of an adult male striped hyena collected by Dr. John C. Phillips and Dr. Glover M. Allen at Magangani, Blue Nile, Sudan. This specimen was recorded by Allen as *Hyæna hienomelas* Matschie, and can be considered as typical of that race, and the much earlier named *dubia* of Schinz. The specimen agrees in all details with our material from Eritrea and British Somali. The form represented differs markedly from *H. h. bergeri* of northern British East Africa. It is decidedly lighter in color throughout, the brown, dark buff, and pinkish tones of *bergeri* are replaced with very pale buff or whitish, and the brown tips to the long hairs of the tail in *bergeri* are replaced with blackish. The animal thus presents a much lighter and more grayish, less buffy and brown, appearance throughout, with a lighter, more whitish tail. The body and limb stripes, as a consequence of the lighter ground color, appear much more sharply marked than in *bergeri*. The skulls of *dubia* are very much as in *bergeri*, but the second upper premolor is placed almost straight in the slightly curving tooth row, not sharply turned diagonally inward anteriorly as in *bergeri*. This character is diagnostic and easily seen in our eleven skulls of *bergeri* and the two skulls of *dubia*, and thus appears to be a constant difference between the two forms. A line drawn along the inner margin of this tooth in *bergeri*, and continued forward to the incisors, crosses the outer incisor on the opposite side of the skull, or at least the next tooth inward. The same line

[1] Roosevelt and Heller, Life-Hist. African Game Anim., vol. 1, p. 255. 1914.

UPPER FIGURE, HIGHLAND STRIPED HYENA; LOWER FIGURE, EASTERN SPOTTED HYENA.

FOR EXPLANATION OF PLATE SEE PAGE 181.

*Measurements of skulls of Hyæna.*

| Form and locality. | No. | Sex. | Condylobasal length. | Zygomatic breadth | Mastoid breadth | Postorbital constriction. | Interorbital constriction. | Rostral breadth over canine. | Lachrymal foramen to alveolar point. | Median length nasals. | Mandible. | Maxillary tooth row. | Lower tooth row, including canine. | Observations. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *H. h. schillingsi.* | | | | | | | | | | | | | | |
| B. E. A.: Sotik | 163110 | Female | 218 | 150 | 81 | 39 | 47 | 52 | 88 | 46 | 169 | 89 | 96 | Teeth considerably worn. |
| *H. h. bergeri.* | | | | | | | | | | | | | | |
| B. E. A.: | | | | | | | | | | | | | | |
| Archer's Post | 182134 | Male | 202 | 140 | 78 | 39 | 47 | 46 | 80 | 43 | 157 | 83 | 91 | Teeth moderately worn. |
| Do | 182135 | Female | 200 | 133 | 75 | 35 | 42 | 44 | 79 | 43 | 154 | 86 | 92 | Basal suture open. |
| Do | 182136 | ...do | 203 | 139 | 76 | 39 | 43 | 45 | 83 | 42 | 157 | 88 | 94 | Teeth moderately worn. |
| Lakiundu River | 182034 | Male | 214 | 157 | 82 | 38 | 49 | 51 | 87 | 47 | 168 | 91 | 99 | Do. |
| Do | 182045 | ...do | 212 | 145 | 79 | 37 | 45 | 48 | 86 | 48 | 168 | 87 | 95 | Do. |
| Do | 182040 | Female | 195 | 140 | 74 | 36 | 44 | 46 | 78 | 42 | 154 | 83 | 91 | Do. |
| Do | 182047 | ...do | 200 | 144 | 78 | 35 | 41 | 46 | 81 | 47 | 156 | 86 | 93 | Do. |
| Merelle Water | 182079 | ...do | 193 | 136 | 70 | 31 | 40 | 44 | 78 | 39 | 152 | 83 | 90 | Teeth considerably worn. |
| Do | 182080 | ...do | 204 | 134 | 73 | 33 | 43 | 43 | 83 | 44 | 153 | 88 | 92 | Teeth moderately worn. |
| Do | 182086 | ...do | 205 | 149 | 75 | 41 | 48 | 48 | 81 | 46 | 161 | 84 | 93 | Teeth much worn. |
| Do | 182100 | ...do | 200 | 139 | 76 | 39 | 43 | 47 | 79 | 41 | 155 | 85 | 93 | Teeth moderately worn. |
| *H. dubia.* | | | | | | | | | | | | | | |
| Sudan: Magangani | [1] 14909 | Male | 207 | 138 | 76 | 33 | 42 | 45 | 83 | 48 | 159 | 84 | 92 | Teeth little worn. |
| Eritrea: Habeseh | 172923 | Female | 202 | 138 | 80 | 31 | 41 | 47 | 83 | 44 | 158 | 87 | 96 | Teeth moderately worn. |

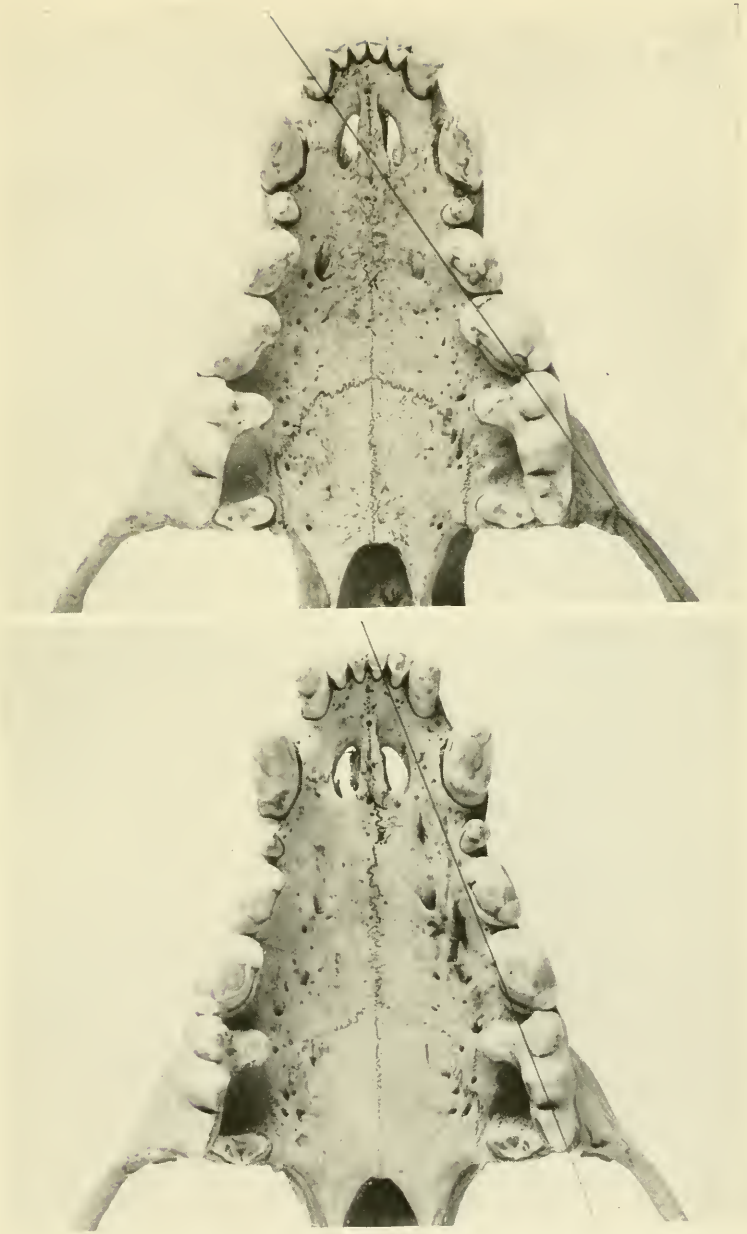
[1] Mus. Comp. Zoology at Harvard.

*External and dental measurements of Hyæna.*

| Form and locality. | No. | Sex. | Head and body. | Tail vertebræ. | Hind foot. | Ear. | Upper carnassial. | Third upper premolar. | Alveolar length of upper canine. | Lower molar. |
|---|---|---|---|---|---|---|---|---|---|---|
| *H. h. schillingsi.* | | | | | | | | | | |
| B. E. A.: Sotik | 163110 | Female | 1100 | 300 | 218 | 150 | 31.2×18.2 | 21.5×13.8 | 14.4 | 19.9×10.7 |
| *H. h. bergeri.* | | | | | | | | | | |
| B. E. A.: | | | | | | | | | | |
| Archer's Post | 182134 | Male | 1020 | 325 | 200 | 138 | 29.7×17.3 | 19.2×13.3 | 13.5 | 19.3×10.5 |
| Do | 182135 | Female | 1020 | 335 | 207 | 142 | 29.2×18.2 | 20.2×12.7 | 13.7 | 19.2× 9.9 |
| Do | 182136 | do | 1020 | 335 | 198 | 138 | 29.9×18.7 | 20.2×12.8 | 13.7 | 20.8×10.2 |
| Lakiundu River | 182034 | Male | 1040 | 330 | 210 | 152 | 29.7×18.0 | 20.0×12.3 | 16.4 | 21.0× 9.8 |
| Do | 182045 | do | 1070 | 345 | 210 | 148 | 29.9×19.2 | 20.4×13.8 | 15.0 | 19.3×10.1 |
| Do | 182040 | Female | 940 | 350 | 190 | 140 | 30.0×18.0 | 20.3×13.1 | 14.3 | 19.9×10.2 |
| Do | 182047 | do | 990 | 325 | 200 | 150 | 28.3×16.7 | 18.6×11.3 | 13.2 | 20.3× 9.5 |
| Merelle Water | 182079 | do | 1020 | 330 | 195 | 140 | 27.8×17.2 | 18.7×12.5 | 14.4 | 19.0×10.1 |
| Do | 182080 | do | 970 | 340 | 192 | 148 | 30.1×16.8 | 18.9×11.7 | 12.2 | 20.3×10.0 |
| Do | 182086 | do | 1030 | 315 | 230 | 140 | 28.2×——[1] | 18.7×12.8 | 15.5 | 18.8×10.1 |
| Do | 182100 | do | 960 | 370 | 205 | 148 | 30.5×17.3 | 19.7×12.9 | 14.7 | 20.5×10.0 |
| *H. dubia.* | | | | | | | | | | |
| Sudan: Magangani | [2] 140909 | Male | 1050 | 290 | 215 | 148 | 28.8×17.8 | 19.6×12.2 | 14.5 | 20.3× 9.8 |
| Eritrea: Habesch | 172923 | Female | ..... | ..... | ..... | ..... | 28.1×17.5 | 18.4×12.6 | 14.4 | 19.1×10.0 |

[1] Much worn.

[2] Mus. Comp. Zoölogy at Harvard.



UPPER FIGURE, HYAENA HYAENA BERGERI; LOWER FIGURE, H. DUBIA.

FOR EXPLANATION OF PLATE SEE PAGE 181.

in *dubia* does not cross the median suture of the palatine plates of the maxillæ, but crosses the inner incisor on the same side of the skull. (See pl. 3.) While the small first upper premolar in *dubia* is nearly anterior to the center of the front face of the larger second premolar, in *bergeri* it is directly in front of the anterior external corner of that tooth, so great is the difference in position of the larger premolar.

### Genus CROCUTA Kaup.

1828. *Crocuta* Kaup, Isis, vol. 21, p. 1145. (*C. crocuta.*)
1829. *Crocotta* Kaup, Ent.-Gesch. Europ. Thierwelt, vol. 1, p. 78.

Numerous forms of the spotted hyena from many parts of Africa have been named by various authors. Most of these species have been based on color differences observed in very small series, or even between single examples of two supposed races. Great stress has been laid on the wide difference between gray, buff, and red examples, and on the color of the spots—black, brown, or red. Minor differences in the skulls have also been represented to be of specific importance. The splendid series of *carefully sexed* skins and skulls of these animals assembled in the United States National Museum by the Smithsonian and the Rainey expeditions has made possible a careful study of individual variation in a large number of specimens from the same region, and a comparison of suitable series from different localities. The results quite discredit many characters which have been considered as of primary importance in distinguishing species. Within a single series of specimens from the Sotik region, for example, are extremes of red and gray types, brown and black spotted types, spotted and unspotted shouldered examples, and remarkable variations in shape and size of the skull. Of more importance, however, are the numerous examples showing every degree of variation between extremes in all these characteristics.

For measurements of specimens see tables, pages 146–149.

#### CROCUTA CROCUTA GERMINANS (Matschie).

Plate 2.

1900. *Hyaena (Crocotta) germinans* Matschie, Sitz.-ber. Ges. nat. Freunde Berlin, p. 27. (Lake Rukwa, German East Africa; type in Berlin Museum.)
1910. *Hyæna crocuta germinans* Roosevelt, African Game Trails, Amer. ed., p. 473; London ed., p. 485.
1911. *Crocuta nzoyæ* Cabrera, Bol. Real Soc. Española Hist. Nat., vol. 9, p. 200. April. (Nzoia River, Guas Ngishu Plateau, British East Africa; type in collection of D. Ricardo de la Huerta, Madrid.)
1914. *Crocuta crocuta germinans* Roosevelt and Heller, Life-Hist. African Game Anim., vol. 1, p. 261.

*Specimens.*—Forty-six, from the following localities:

British East Africa: Guas Ngishu Boma, 1 (K. Roosevelt); Kabalolot Hill, Sotik, 10 (Heller, Rainey); Kampiya bibi, Guas

Ngishu Plateau, 4 (T. Roosevelt, K. Roosevelt); Kitanga Farm, 2 (K. Roosevelt, Mearns); Lake Naivasha, 3 skulls (Heller, Mearns); Loita Plains, 3 (Heller); Mtoto Andei, 1 (Heller); Nairobi, 2 skulls (Mearns); Nzoia River, Guas Ngishu Plateau, 4 (White, Heller); Southern Guaso Nyiro River, 4 (T. Roosevelt, Loring, Heller); Southwest side Mount Kenia, 3 (Heller, Loring); Telek River, Sotik, 7 (Heller); Ulukenia Hills, 1 skull (Loring).

German East Africa: Head of Wadiola River, 1 skull (E. Clark).

The weight of an adult male (basal suture closed) shot by Kermit Roosevelt on the Guas Ngishu Plateau was 120 pounds. Two adults, male and female, from the southwest side of Mount Kenia, weighed by Heller, are recorded at 136 pounds each. A female collected by Heller on the Telek River, May 18, was nursing two small cubs, which were trapped at the same time. On the Loita Plains, May 31, Heller removed two large fetuses from a female spotted hyena. These lived three days after being cut out of the dead female.

I am unable to distinguish by any character whatever the series of skins and skulls from the Guas Ngishu Plateau, topotypes of Cabrera's *Crocuta nzoyæ*, from the series collected in the Southern Guaso Nyiro and Sotik. Both series contain specimens bridging in every particular all variations in color and markings between red and gray types, between blackish and light brown spotted types, and between any extremes in shape and size of skull and teeth. No specimens from the type regions of Lönnberg's red and gray species from the Kilimanjaro region, *Crocotta kibonotensis*[1] and *Crocotta panganensis*,[2] are in our collection. As stated by Roosevelt and Heller,[3] the two extremes of color and length of tail on which these species are based are represented, with every intermediate stage, in the Sotik and Southern Guaso Nyiro series of specimens in the United States National Museum, and the validity of the forms is very questionable. In the light of the proved variability of *germinans*, the form described by Cabrera from Ankole, Uganda, *Crocuta thomasi*,[4] is also not satisfactorily diagnosed. We have no specimens from the type region.

Two very small pups in the collection are uniform seal-brown in color, without markings. Half-grown young are all dark gray in color, heavily spotted with black, and with black legs and feet. Larger young ones show more variation in color, but not such extremes of red and gray as in old adults.

Dimensions of all immature specimens have been excluded from the tables of measurements on pages 146–148.

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[1] Sjöstedt's Kilimandjaro-Meru Exped., p. 16. 1908.

[2] Idem, p. 18.

[3] Life-Hist. African Game Animals, vol. 1, p. 261. 1914.

[4] Proc. Zool. Soc. London, 1910, p. 98. March, 1911.

CROCUTA CROCUTA FISI Heller.

Plates 39, 40.

1914. *Crocuta crocuta fisi* Heller, Smithsonian Misc. Coll., vol. 61, No. 22, p. 5. January 26. (Merelle Waterholes, Marsabit Road, British East Africa; type in U. S. Nat. Mus.)

1914. *Crocuta crocuta fisi* Roosevelt and Heller, Life-Hist. African Game Animals, vol. 1, p. 263.

*Specimens.*—Seventeen, from localities as follows:

British East Africa: Archer's Post, 1 skull (Heller); Koya Water, Marsabit Road, 4 (Heller); Lakiundu River, 1 (Heller); Merelle Water, Marsabit Road, 9 (Heller); Northern Guaso Nyiro River, 1 (K. Roosevelt); Quoy Water, Marsabit Road, 1 skull (Heller).

The skins of this pale-colored, short-haired race of the spotted hyena are much more uniform in color and markings than are skins of the common East African *C. c. germinans*. The ground color of the body is light buff and the spots are small. This latter feature is due somewhat to the shortness of the pelage, which makes the markings seem more clear cut and distinct than in the long-haired race. The subspecific name is taken from the native name, *fisi*, by which the spotted hyena is known to the Swahili and other coast tribes.

CROCUTA CROCUTA LEONTIEWI (Satunin).

1905. *Hyaena* (*Crocuta*) *leontiewi* Satunin, Zool. Anz., vol. 29, No. 17, p. 556. November 28. (Abyssinia, exact locality not known; type in Petrograd Museum.)

*Specimens.*—Two, as follows:

Eritrea: "Habesch" (Schrader).

These two skins are pale cinnamon on the back, dirty buff on the flanks, and more reddish on the withers, neck, and head. On one the spots are very dark, almost black, while on the other they are pale brown. Both are in rather faded and worn pelage: the hair, except on neck and withers, is quite short, though longer than the body hair in *Crocuta c. fisi* of northern British East Africa.

The hyena described by Cabrera from Odweina, 100 miles south of Berbera, Somali, as *Crocuta rufopicta* [1] must be very close to, if not identical with, this form. None of the characters given in the original description, at any rate, are more than individual, as shown by the series of hyenas in the United States National Museum, and there is little reason to expect that more material would disclose any important constant differences between hyenas from the two localities.

[1] Proc. Zool. Soc. London, 1910, p. 97. March, 1911.

*Measurements of skulls of Crocuta.*

| Form and locality. | No. | Sex. | Condylo-basal length. | Zygo-matic breadth. | Mastoid breadth. | Post-orbital con-striction. | Inter-orbital con-striction. | Rostral breadth over canine. | Lachry-mal foramen to alveolar point. | Greatest length nasals. | Man-dible. | Maxil-lary tooth row. | Lower tooth row, in-cluding canine. | Observations. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *C. c. germinans.* | | | | | | | | | | | | | | |
| B. E. A.: Telek River | 181527 | Male | 233 | 173 | 99 | 44 | 55 | 59 | 97 | 59 | 185 | 100 | 109 | Basal suture closed. |
| Do | 181529 | do | 236 | 167 | 98 | 49 | 58 | 61 | 100 | 59 | 182 | 97 | 105 | Basal suture open. |
| Do | 181530 | Female | 240 | 164 | 95 | 45 | 58 | 62 | 98 | 60 | 182 | 98 | 106 | Basal suture closed. |
| Kabalalot Hill | 181518 | Male | 234 | 166 | 96 | 44 | 60 | 65 | 98 | 60 | 181 | 100 | 107 | Do. |
| Do | 181519 | do | 225 | 155 | 92 | 43 | 53 | 57 | 89 | 51 | 172 | 94 | 101 | Do. |
| Do | 181520 | do | 230 | 164 | 96 | 42 | 54 | 61 | 94 | 51 | 178 | 98 | 101 | Do. |
| Do | 181521 | do | 238 | 166 | 98 | 43 | 53 | 59 | 97 | 65 | 180 | 100 | 106 | Do. |
| Do | 181525 | do | 231 | 165 | 97 | 47 | 58 | 57 | 94 | 57 | 183 | 96 | 102 | Do. |
| Do | 181516 | Female | 237 | 164 | 97 | 46 | 53 | 59 | 96 | 52 | 177 | 100 | 108 | Do. |
| Do | 181522 | do | 240 | 167 | 95 | 40 | 55 | 61 | 98 | 64 | 186 | 100 | 108 | Basal suture open. |
| Do | 181524 | do | 254 | 174 | 100 | 44 | 57 | 61 | 101 | 60 | 192 | 106 | 113 | Basal suture closed. |
| Do | 181526 | do | 236 | 156 | 91 | 38 | 51 | 60 | 93 | 59 | 179 | 99 | 109 | Do. |
| Loita Plains | 181534 | do | 226 | 170 | 93 | 45 | 51 | 59 | 92 | 52 | 171 | 94 | 103 | Do. |
| South Guaso Nyiro | 162920 | Male | 228 | 157 | 90 | 39 | 48 | 59 | 91 | 60 | 176 | 96 | 104 | Do. |
| Do | 181515 | do | 229 | 161 | 96 | 40 | 49 | 58 | 90 | 52 | 173 | 96 | 104 | Do. |
| Southwest Mount Kenia | 164502 | do | 225 | 160 | 90 | 44 | 55 | 54 | 92 | 62 | 172 | 94 | 101 | Do. |
| Do | 163099 | Female | 244 | 163 | 93 | 40 | 48 | 59 | 96 | 67 | 189 | 98 | 108 | Do. |
| Do | 163299 | do | 231 | 159 | 95 | 43 | 51 | 56 | 89 | 48 | 177 | 95 | 102 | Basal suture open |
| Nzoia River | 163104 | Male | 224 | 147 | 90 | 44 | 48 | 58 | 92 | 47 | ..... | 95 | 104 | Do. |
| Do | 163344 | do | 228 | 152 | 95 | 41 | 51 | 57 | 92 | ..... | 175 | 95 | 101 | Do. |
| Do | 173004 | do | 221 | 160 | 92 | 41 | 51 | 58 | 89 | 55 | 172 | 96 | 101 | Do. |
| Kampiya bibi | 163102 | do | 228 | 162 | 95 | 44 | 51 | 55 | 91 | 60 | 175 | 96 | 102 | Basal suture closed. |
| Do | 163101 | Female | 226 | 161 | 94 | 39 | 54 | 59 | 93 | 58 | 176 | 98 | 105 | Do. |
| Do | 163103 | do | 233 | 164 | 91 | 37 | 52 | 60 | 95 | 51 | 177 | 99 | 105 | Do. |
| Do | 164506 | do | 231 | 163 | 91 | 42 | 54 | 59 | 95 | 62 | 176 | 96 | 103 | Do. |
| Guas Ngishu Boma | 163105 | do | 232 | 164 | 92 | 42 | 56 | 61 | 97 | 51 | 177 | 97 | 105 | Do. |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *C. c. fisi.* | | | | | | | | | | | | | |
| Merelle Water | [1]182078 | Male | 230 | 156 | 93 | 47 | 57 | 59 | 91 | 53 | 176 | 95 | 102 | Basal suture open. |
| Do | 182091 | ...do | 230 | 165 | 99 | 47 | 58 | 60 | 91 | 57 | 178 | 95 | 103 | Do. |
| Do | 182095 | ...do | 235 | 163 | 93 | 43 | 54 | 58 | 91 | 58 | 181 | 98 | 104 | Basal suture closed. |
| Do | 182101 | ...do | 232 | 162 | 97 | 44 | 51 | 57 | 91 | 50 | 178 | 98 | 106 | Basal suture open. |
| Do | 182103 | ...do | 229 | 160 | 91 | 42 | 53 | 59 | 92 | 61 | 176 | 96 | 103 | Do. |
| Do | 182085 | Female | 225 | 164 | 94 | 44 | 58 | 56 | 89 | 62 | 175 | 94 | ..... | Basal suture closed. |
| Lakiundu River | 182032 | ...do | 235 | 175 | 99 | 47 | 60 | 59 | 101 | 67 | 183 | 98 | 107 | Do. |
| North Guaso Nyiro River | 163100 | ...do | 231 | 166 | 93 | 42 | 54 | 58 | 95 | 54 | 177 | 100 | 105 | Do. |
| Koya Water | 182105 | Male | 230 | 164 | 98 | 40 | 50 | 59 | 92 | 53 | 176 | 95 | 104 | Basal suture open. |
| Do | 182113 | ...do | 242 | 162 | 96 | 48 | 59 | 58 | 98 | 54 | 180 | 101 | 109 | Basal suture closed. |
| Quoy Water | 182117 | ...do | 229 | 160 | 99 | 44 | 53 | 59 | 90 | 53 | 173 | 94 | 101 | Basal suture open. |
| Archer's Post | 182210 | Female | 235 | 170 | 97 | 44 | 54 | 61 | 94 | 53 | 178 | 95 | 104 | Basal suture closed. |
| *C. c. leontiewi.* | | | | | | | | | | | | | | |
| Eritrea: Habesch | 122544 | ..... | ..... | 170 | 98 | 45 | 62 | 63 | 103 | 63 | 189 | 103 | 115 | Teeth moderately worn. |
| Do | 172924 | ..... | ..... | 152 | 95 | 37 | 50 | 55 | 93 | 50 | 173 | 96 | 104 | Basal suture open. |

[1] Type.

*External and dental measurements of specimens of Crocuta.*

| Form and locality. | No. | Sex. | Head and body. | Tail vertebræ. | Hind foot. | Ear. | Alveolar length of upper canine. | Upper carnassial. | Third upper premolar. | Lower molar. |
|---|---|---|---|---|---|---|---|---|---|---|
| *C. c. germinans.* | | | | | | | | | | |
| B. E. A.: Telek River | 181527 | Male | 1210 | 240 | 230 | 114 | 17.2 | 35.8×19.4 | 21.6×16.2 | 27.7×11.6 |
| Do | 181529 | do | 1160 | 300 | 230 | 104 | 17.7 | 34.9×18.6 | 21.8×15.8 | 25.8×11.1 |
| Do | 181530 | Female | 1210 | 280 | 225 | 112 | 17.1 | 34.7×20.5 | 21.9×16.6 | 26.8×11.5 |
| Kabalolot Hill | 181518 | Male | 1240 | | 210 | 105 | 19.0 | 37.6×21.7 | 23.2×17.1 | 28.4×11.6 |
| Do | 181519 | do | 1190 | 280 | 210 | 103 | 15.6 | 33.9×19.5 | 22.1×15.5 | 25.6×10.9 |
| Do | 181520 | do | 1280 | 300 | 240 | 108 | 17.3 | 35.2×19.4 | 21.7×15.5 | 26.2×11.4 |
| Do | 181521 | do | 1190 | 290 | 240 | 110 | 17.5 | 36.7×19.4 | 21.6×15.8 | 26.2×11.1 |
| Do | 181525 | do | 1180 | 275 | 230 | 115 | 15.5 | 32.9×18.1 | 20.8×14.2 | 24.8×10.5 |
| Do | 181516 | Female | 1180 | 240 | 222 | 107 | 17.2 | 34.7×20.1 | 21.4×16.2 | 28.7×11.8 |
| Do | 181522 | do | | | | | 17.4 | 36.0×20.8 | 22.5×16.5 | 27.2×11.7 |
| Do | 181524 | do | 1320 | 280 | 215 | 115 | | 36.4×21.0 | 24.2×16.0 | 28.9×11.8 |
| Do | 181526 | do | | | | | 17.7 | 36.7×21.5 | 22.7×17.2 | 29.7×12.0 |
| Loita Plains | 181534 | do | 1180 | 290 | 205 | 105 | 18.6 | 34.0×20.1 | 22.0×15.1 | 27.4×11.8 |
| So. Guaso Nyiro | 162920 | Male | 1190 | 250 | 235 | 110 | 16.6 | 34.8×17.9 | 21.9×14.2 | 27.5×10.8 |
| Do | 181515 | do | 1140 | 265 | 220 | 103 | 16.9 | 34.7×19.6 | 19.7×14.9 | 26.2×10.7 |
| S. W. Mount Kenia | 164502 | do | 1250 | 250 | 240 | 115 | 13.6 | 33.8×19.4 | 20.6×14.3 | 25.6×11.0 |
| Do | 163099 | Female | 1300 | 280 | 245 | 110 | 15.1 | 33.7×18.8 | 20.2×15.4 | 26.3×11.2 |
| Do | 163299 | do | 1130 | 230 | 253 | | 16.0 | 36.4×20.1 | 21.8×17.2 | 27.1×11.2 |
| Nzoia River | 163104 | Male | 1050 | 320 | 220 | 110 | 17.0 | 34.3×20.2 | 22.7×16.2 | 27.2×11.7 |
| Do | 163344 | do | 1115 | 270 | 220 | 110 | 16.7 | 34.8×20.0 | 22.2×15.9 | 25.2×11.0 |
| Do | 173004 | do | | | | | 16.5 | 35.1×20.3 | 22.0×15.6 | 25.8×11.3 |
| Kampiya bibi | 163102 | do | | 310 | 230 | 110 | 18.2 | 33.8×18.7 | 21.0×14.4 | 25.7×10.7 |
| Do | 163101 | Female | 1310 | 300 | 215 | 110 | 18.3 | 34.2×21.1 | 23.0×16.5 | 25.9×11.4 |
| Do | 163103 | do | | 290 | 230 | 108 | 17.5 | 35.4×20.7 | 23.1×17.5 | 28.0×12.2 |
| Do | 164506 | do | 1250 | 320 | 220 | 115 | 17.5 | 32.7×18.5 | 21.3×16.4 | 26.0×11.3 |
| Guas Ngishu Boma | 163105 | do | 1300 | 280 | 220 | | 16.0 | 35.9×18.3 | 22.8×16.4 | 26.3×11.3 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| *C. c. fusi.* | | | | | | | | | | |
| Merelle Water | [1]182078 | Male | 1150 | 295 | 225 | 100 | 15.8 | 35.0×20.5 | 22.1×16.5 | 26.0×11.0 |
| Do | 182091 | do | 1290 | 270 | 235 | 112 | 16.3 | 35.6×19.9 | 21.6×16.2 | 26.0×11.1 |
| Do | 182035 | do | 1180 | 300 | 230 | 110 | 17.5 | 36.8×21.3 | 22.5×16.9 | 28.1×11.8 |
| Do | 182101 | do | 1160 | 310 | 235 | 110 | 16.4 | 34.6×19.9 | 22.6×14.9 | 26.9×11.2 |
| Do | 182103 | do | | | | | 16.4 | 37.1×19.0 | 22.0×16.3 | 27.5×11.6 |
| Do | 182085 | Female | 1190 | 270 | 220 | 112 | | 32.9×19.7 | 21.5×15.1 | 26.2×11.5 |
| Lakiundu River | 182032 | do | 1170 | 275 | 230 | 108 | 16.7 | 33.3×18.8 | 21.4×14.8 | 26.7×11.3 |
| N. Guaso Nyiro River | 103100 | do | | | | | 19.3 | 37.0×20.4 | 22.8×16.5 | 27.8×11.7 |
| Koya Water | 182105 | Male | | | | | 16.6 | 35.7×20.0 | 21.9×16.0 | 27.4×11.5 |
| Do | 182113 | do | | | | | 17.5 | 36.3×20.9 | 23.3×15.9 | 28.5×12.0 |
| Quoy Water | 182117 | do | 1200 | 265 | 235 | 111 | 16.1 | 33.0×19.3 | 21.6×15.0 | 24.9×10.9 |
| Archer's Post | 182210 | Female | | | | | 15.9 | 32.0×17.9 | 21.5×15.1 | 25.5×10.2 |
| *C. c. leontiewi.* | | | | | | | | | | |
| Eritrea: Habesch | 122544 | | | | | | 17.4 | 38.2×21.2 | 22.5×17.2 | 30.3×12.3 |
| Do | 172921 | | | | | | 15.2 | 35.0×19.5 | 21.5×15.9 | 26.6×11.0 |

[1] Type.

## Family FELIDÆ.

### Genus ACINONYX Brookes.

1828. *Acinonyx* Brookes, Cat. Anat. & Zool. Mus. Joshua Brookes, p. 16. (*A. venatica.*[1])

1830. *Cynailurus* Wagler, Nat. Syst. Amphib., p. 30. (*A. jubatus.*)

1907. *Acinonyx* Elliot, Field Mus., Zool. ser., vol. 8, p. 396.

1911. *Acinonyx* Hollister, Proc. Biol. Soc. Washington, vol. 24, p. 225. October 31.

The African cheetah, *Acinonyx jubatus* (Schreber),[2] has been divided into several subspecies by recent authors. Some of these geographic races are doubtless well marked, but the practice of naming subspecies based upon living animals in zoological parks and upon descriptions taken from old works like Wagner, 1841, as applied by Hilzheimer,[3] can not be too strongly condemned. The older accounts of mammals are often too inaccurate for subspecific determination and zoological park specimens are frequently of uncertain origin. Captive animals are often traded and sold, and on the death of an individual which is really the type-specimen of the race, all trace of it has been lost and it is not preserved for reference in any collection. The name applied to the form thus becomes doubly doubtful, as no description based upon a living animal, however carefully prepared, is sufficiently accurate for the determination of subspecies if the exact locality is uncertain. Mammals kept in captivity in strange climates change the color of the coat so decidedly and so rapidly that such accounts of fine differences in shade or tone of ground color or markings are absolutely valueless.

Colonel Roosevelt states that the cheetahs prey on the smaller antelopes, occasionally taking something as big as a half-grown kongoni. Regarding the speed of the cheetah he writes:

> For a short run, up to say a quarter of a mile or even perhaps half a mile, they are the swiftest animals on earth, and with a good start easily overtake the fastest antelope; but their bolt is soon shot, and on the open plain they can readily be galloped down with a horse.[4]

For measurements of specimens of cheetahs see pages 153–154.

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[1] The type-species of *Acinonyx* is *Acinonyx venator* Brookes, by monotypy. The name is a synonym of *Felis venatica* Smith, Griffith's Cuvier, vol. 5, p. 166, 1837, the Indian cheetah. A reexamination of the copy of Brookes's Catalogue in the Library of the Surgeon General's Office convinces me that the name "*Acinonyx guepard*," which has been cited from Brookes, does not occur at any place in the work, even as a *nomen nudum*. The names occur in this form: "Acinonyx. Gue'pard." (p. 33.) They signify the technical and common names of the genus. The generic name *Acinonyx* and the specific name *A. venator* are valid only on page 16 of the "Catalogue," where the genus is properly diagnosed.

[2] Dr. Max Hilzheimer has attempted to show that this name should apply to the Indian cheetah, on the basis of the coloring of the wretched picture in Schreber's Säugthiere (pl. 105). The plate in question is barely identifiable as to genus, much less as to species or subspecies, and the type-locality of *jubatus* is fixed as the Cape of Good Hope from Schreber's text (vol. 3, pp. 392–393). See Hollister, Proc. Biol. Soc. Washington, vol. 24, pp. 225–226, October 31, 1911; Hilzheimer, Sitz.-ber. Gas. nat. Fr. Berlin, 1913, pp. 283–292; and Hollister, Proc. Biol. Soc. Washington, vol. 27, p. 216, October 31, 1914.

[3] Sitz.-ber. Ges. nat. Freunde Berlin, 1913, pp. 283–292.

[4] African Game Trails, p. 124. 1910.

### ACINONYX JUBATUS RAINEYI Heller.

Plates 5, 41.

1910. *Cynælurus jubatus guttatus* Roosevelt, African Game Trails, Amer. ed., p. 476; London ed., p. 487. (Part; not of Hermann.)

1913. *Acinonyx jubatus raineyi* Heller, Smithsonian Misc. Coll., vol. 61, No. 19, p. 9. November 8. (Ulu Station, Kapiti Plains, British East Africa; type in U. S. Nat. Mus.)

1914. *Acinonyx jubatus raineyi* Roosevelt and Heller, Life-Hist. African Game Animals, vol. 1, p. 428.

*Specimens.*—Six, from localities as follows:

British East Africa: Juja Farm, Athi Plains, 1 (McMillan); Kapiti Station, 1 (Rainey); Ulu Station, 3 (Rainey); Wami Hill, Kapiti Plains, 1 (K. Roosevelt).

This is a very slightly marked form of the cheetah, barely recognizable from *Acinonyx jubatus velox.* There are three skins of fully adult animals in the collection, and when these are compared with the series of *velox* a few average differences in color are noticeable, but these are by no means well marked or constant. The peculiar pinkish cast to the buffy ground color is almost matched in intensity by two skins from the Loita Plains; and the larger, less thickly placed body spots, and slightly less heavily marked feet are also characteristics closely (though not quite) matched in certain skins of *velox.* It is desirable that more skins of *raineyi* be obtained for further study.

The cheetah described by Hilzheimer from Ngorongoro, south of Lake Natron, German East Africa, as *Acinonyx guttatus ngorongorensis,*[1] should be, theoretically, the same form as this. There are certain discrepancies in the description, however, which make it unsafe to combine the two without better evidence. The type of *ngorongorensis* is said to be in ground color "Isabella yellow-brown," the underside "very light Isabella entirely without white;" the cheeks grayish, the back of the ear "yellow, with a slender black stripe at the base." All of these statements disagree with the specimens of *raineyi* which are distinctly pinkish-buff in ground-color; the belly is largely white, the cheeks not grayish, and the ear has the normal wide black area across its base. Hilzheimer's description was drawn up from a specimen living in the Leipzig Zoological Garden and may be faulty; the animal may have changed color greatly, as captive cats in strange climates are known to do; or the locality may be erroneous. Cheetahs are sometimes captured by natives and traded alive, and might reach Europeans some distance from the original point of capture. The name has priority over *raineyi,* and additional specimens from the Ngorongoro district are greatly desired as an aid in settling its status.

[1] Sitz.-ber. Ges. nat. Freunde Berlin, 1913, p. 290.

ACINONYX JUBATUS VELOX Heller.

Plate 42.

1910. *Cynælurus jubatus guttatus* Roosevelt, African Game Trails, Amer. ed., p. 476; London ed., p. 487. (Part; not of Hermann.)

1913. *Acinonyx jubatus velox* Heller, Smithsonian Misc. Coll., vol. 61, No. 19, p. 7. November 8 (Agate's, Loita Plains, British East Africa; type in U. S. Nat. Mus.).

1914. *Acinonyx jubatus velox* Roosevelt and Heller, Life-Hist. African Game Anim., vol. 1, p. 246.

*Specimens.*—Thirteen, from the following localities:

British East Africa: Agate's, Loita Plains, 3 (K. Roosevelt, Heller); Engare Ndare River, 1 skull (Johnston); Laikipia, 2 (K. Roosevelt); Lime Springs, Southern Guaso Nyiro, 2 (K. Roosevelt); Loita Plains, 4 (Rainey); Nzoia River, Guas Ngishu Plateau, 1 skull (White).

The skull from the Guas Ngishu Plateau, I doubtfully place with this form. It is so much larger than any skull of *velox* or of *raineyi* in the collection that the difference in size can not be due entirely to greater age, although it is from an animal unquestionably older than any others in the series. With no skins from the Guas Ngishu country and no skulls of *Acinonyx jubatus sœmmeringii* from Kordofan for comparison, it seems best at present to consider it an extraordinarily large skull of *velox*. The distribution of this cheetah is given by Roosevelt and Heller as "from the Rift Valley and Laikipia Plateau westward over the highland country as far as the Nile lowlands; north to the latitude of Nimule and south through German East Africa." [1]

ACINONYX JUBATUS SŒMMERINGII (Fitzinger).

1855. *Cynailurus sœmmeringii* Fitzinger, Sitz.-ber. Math.-nat. cl. d. K. acad. Wiss., vol. 17, hft. 2, p. 245. (Bajuda Steppe, Kordofan.)

1911. *Acinonyx sœmmeringii* Hollister, Proc. Biol. Soc. Washington, vol. 24, p. 226. October 31.

1913. *Acinonyx wagneri* Hilzheimer, Sitz.-ber. Ges. nat. Freunde Berlin, No. 5, p. 285. (Kordofan; based on description of specimen, collected by Rüppell, in Wagner's Schreber Säug., Suppl., vol. 2, p. 503, 1841.)

1914. *Acinonyx jubatus sœmmeringii* Roosevelt and Heller, Life-Hist. African Game Anim., vol. 1, p. 249.

*Specimen.*—One skin, as follows:

Sudan: El Dueim, White Nile (Mearns).

This skin indicates a well-marked form, in which the spots are much reduced in number and in size. The ground color of the upperparts is decidedly "pinkish-buff," much as in *A. j. raineyi* of the British East African lowlands.

[1] Life-Hist. African Game Animals, vol. 1, p. 246. 1914.

*Measurements of skulls of Acinonyx from British East Africa.*

| Form and locality. | No. | Sex. | Condylo-basal length. | Greatest length. | Zygomatic breadth. | Mastoid breadth. | Interorbital constriction. | Rostral breadth over canine. | Lachrymal foramen to alveolar point. | Greatest length nasals. | Mandible. | Maxillary tooth row. | Lower tooth row, including canine. | Observations. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *A. j. raineyi.* | | | | | | | | | | | | | | |
| Kapiti Station | [1] 182321 | Male | 162 | 180 | 122 | 68 | 39.2 | 49 | 65 | 56 | 127 | 55.1 | 59.3 | Basal suture open. |
| Ulu Station | 182319 | Female | 154 | 170 | 120 | 69 | 38.6 | 46 | 59 | 55 | 116 | 50.6 | 54.5 | Basal suture closed. |
| Do | 182322 | do | 157 | 179 | 122 | 70 | 40.7 | 49 | 65 | 60 | 122 | 53.0 | 56.8 | |
| Wami Hill | 161922 | Male | 169 | 190 | 133 | 73 | 41.8 | 52 | 68 | 63 | 131 | 56.0 | 62.0 | Do. |
| *A. j. velox.* | | | | | | | | | | | | | | |
| Agate's | [1] 163096 | Male | 163 | 179 | 136 | 75 | 39.9 | 52 | 62 | 56 | 128 | 53.8 | 59.6 | Basal suture closed. |
| Do | 163097 | Female | 146 | 162 | 119 | 65 | 39.0 | 46 | 60 | 54 | 112 | 52.0 | 55.4 | Do. |
| Do | 163098 | do | 155 | 172 | 121 | 66 | 38.2 | 47 | 61 | 55 | 118 | 51.7 | 55.3 | Do. |
| Lime Springs | 162928 | do | 150 | 165 | 122 | 67 | 38.0 | 46 | 60 | 53 | 117 | 50.5 | 54.6 | Do. |
| Do | 162929 | do | 153 | 173 | 120 | 69 | 38.8 | 47 | 65 | 55 | 115 | 52.8 | 57.1 | Do. |
| Loita Plains | 181596 | Male | 167 | 183 | 126 | 70 | 40.4 | 50 | 64 | 59 | 125 | 57.8 | 61.3 | Basal suture open. |
| Do | 181597 | do | 170 | 190 | 129 | 74 | 41.5 | 52 | 69 | 62 | 133 | 57.9 | 62.9 | Basal suture closed. |
| Do | 181598 | do | 165 | 183 | 127 | 73 | 43.9 | 52 | 68 | 54 | 130 | 57.8 | 60.8 | Basal suture open. |
| Ngare Ndare River | 182698 | Female | 154 | 173 | 117 | 66 | 36.7 | 46 | 62 | 55 | 118 | 50.8 | 54.2 | Do. |
| Laikipia | 163090 | Male | 155 | 173 | 125 | 71 | 40.1 | 49 | 63 | 58 | ..... | 52.5 | 57.1 | Do. |
| Do | 163091 | Female | 153 | 170 | 120 | 66 | 39.5 | 47 | 61 | 52 | 118 | 51.2 | 55.6 | Basal suture closed. |
| Guas Ngishu Plat | 173001 | Male | 176 | 200 | 144 | 79 | 46.2 | 56 | 74 | 67 | 138 | 58.4 | 62.3 | Do. |

[1] Type.

*External and dental measurements of specimens of Acinonyx from British East Africa.*

| Form and locality. | No. | Sex. | Head and body. | Tail vertebræ. | Hind foot. | Ear. | Alveolar length of upper canine. | Upper carnassial. | Second upper premolar. | Lower molar. |
|---|---|---|---|---|---|---|---|---|---|---|
| *A. j. raineyi.* | | | | | | | | | | |
| Kapiti Station | [1] 182321 | Male | | | | | 11.2 | 22.1× 9.1 | 14.6×6.4 | 17.6×7.4 |
| Ulu Station | 182319 | Female | | | | | 10.1 | 22.5× 8.8 | 12.9×5.7 | 17.1×7.2 |
| Do | 182322 | .....do | | | | | 10.7 | 23.7× 9.4 | 13.0×6.2 | 17.6×7.5 |
| Wami Hill | 161922 | Male | 1260 | 775 | 300 | 43 | 11.8 | 23.6× 9.3 | 14.8×6.6 | 18.9×7.8 |
| *A. j. velox.* | | | | | | | | | | |
| Agate's | [1] 163096 | Male | 1300 | 740 | 300 | 80 | 12.0 | 22.7× 9.7 | 14.3×6.2 | 17.8×7.4 |
| Do | 163097 | Female | 1220 | 720 | 280 | 80 | 10.3 | 22.6× 8.9 | 14.0×6.3 | 17.6×7.5 |
| Do | 163098 | .....do | 1230 | 800 | 285 | 78 | 10.0 | 22.2× 9.1 | 13.3×5.9 | 16.8×7.5 |
| Lime Springs | 162928 | .....do | 1250 | 750 | 290 | 80 | 10.0 | 20.9× 8.6 | 13.3×6.1 | 16.5×7.2 |
| Do | 162929 | .....do | 1240 | 750 | 290 | 80 | 10.4 | 22.8× 8.7 | 13.3×6.3 | 17.1×7.5 |
| Loita Plains | 181596 | Male | 1120 | 780 | 280 | 82 | 11.8 | 22.7× 9.5 | 14.2×6.9 | 17.6×7.7 |
| Do | 181597 | .....do | 1170 | 790 | 287 | 80 | 11.9 | 23.4× 9.2 | 14.8×6.5 | 17.7×7.7 |
| Do | 181598 | .....do | 1150 | 755 | 285 | 78 | 11.8 | 23.6× 9.4 | 14.5×6.1 | 17.6×7.6 |
| Ngare Ndare River | 182698 | Female | 1140 | 750 | 270 | 72 | 9.8 | 21.2× 8.7 | 13.1×6.5 | 16.4×7.2 |
| Laikipia | 163090 | Male | | | | | 10.9 | 23.1× 9.0 | 13.5×6.7 | 17.5×7.5 |
| Do | 163091 | Female | | | | | 10.1 | 22.4× 9.2 | 13.7×6.6 | |
| Guas Ngishu Plat | 173001 | Male | | | | | 12.2 | 23.2×10.2 | 14.8×7.0 | 18.7×7.9 |

[1] Type.

### Genus FELIS Linnæus.

1758. *Felis* Linnæus, Syst. Nat., ed. 10, p. 41. (*F. catus.*)
1816. *Panthera* Oken, Lehrb. Nat., 3ter Theil, 2te Abth., p. 1052. (*F. pardus.*)
1816. *Leo* Oken, Lehrb. Nat., 3ter Theil, 2te Abth., p. 1070. (*F. leo.*)
1855. *Catus* Fitzinger, Wiss.-pop. Nat. Säug., vol. 1, p. 265. (*F. catus.*)
1858. *Catolynx* Severtzow, Rev. Mag. Zool., Paris, ser. 2, vol. 10, p. 385. September. (*F. silvestris*=*F. catus* Authors.)
1858. *Leptailurus* Severtzow, Rev. Mag. Zool., Paris, ser. 2, vol. 10, p. 389. September. (*F. serval.*)
1864. *Serval* Brehm, Führer Zool. Garten Hamburg. Sechste Auflage, p. 53. (*Serval maculatus* from Algeria.)
1866. *Galeopardus* Fitzinger, Sitz.-ber. Math.-Nat. Kais. Akad. Wiss., Wien, vol. 54, p. 557. (*F. serval.*)
1894. *Leonina* Grevé, Nov. Act. Acad. Cæs. Leop., vol. 63, p. 60. (*F. leo.*)
1894. *Servalina* Grevé, Nov. Act. Acad. Cæs. Leop., vol. 63, p. 76. (*F. serval.*)

Four groups of cats of the genus *Felis* are included in our East African collections. These are the lions, leopards, servals, and the small wild cats. The larger species, the lion and the leopard, are much better represented in the collection than are the smaller serval and the much smaller wild cat. The four groups have been considered by various authors as distinct genera, but until a carefully worked out monograph of the superspecific groups of cats appears it seems of little use to separate them.[1] The African wild cat is very closely related to the wild cat of Europe, and is generally believed to be the ancestral species of the common domestic cat.

#### FELIS LEO MASSAICA Neumann.

Plates 4, 52, 53, 54, 55.

1900. *Felis leo massaicus* Neumann, Zool. Jahrb., Syst., vol. 13, p. 550. (Kibaya, German East Africa; type in Berlin Mus.)
1908. *Felis leo* subsp. *sabakiensis* Lönnberg, Sjöstedt's Kilimandjaro-Meru Exped., Mamm., p. 22. (Kibonoto and Leitokitok, German East Africa.)
1910. *Felis leo sabakiensis* Hollister, Smithsonian Misc. Coll., vol. 56, No. 2, p. 11. March 31.
1910. *Felis leo massaica* Roosevelt, Afr. Game Trails, Amer. ed., p. 476; London ed., p. 487. (Part.)
1914. *Felis leo massaica* Roosevelt and Heller, Life-Hist. Afr. Game Anim., vol. 1, p. 222; map, p. 227. (Part.)
1917. *Felis leo massaica* Hollister, Proc. U. S. Nat. Mus., vol 53, p. 177. June 1.

*Specimens.*—Fifty-nine from the following localities:

British East Africa: Guas Ngishu Plateau, 1 (White); Kapiti Station, 24 (Rainey, Loring, Johnston); Kitanga, 5 (T. Roosevelt, Rainey); Laikipia Plateau, 4 (K. Roosevelt); Lakiunda River, 1 (Heller); Marsabit Road, 1 (Heller); Mount Kilimanjaro, north-

[1] Since this page has been in type a paper on The Classification of Existing Felidæ, by R. I. Pocock, has appeared in the Annals and Magazine of Natural History, series 8, vol. 20, pp. 329–350, November, 1917. According to Mr. Pocock, the lion and leopard belong to the genus *Panthera;* the serval to the genus *Leptailurus;* and the small wild cats, together with the domestic species, to the restricted genus *Felis.*

east side, 2 (Abbott); Mount Lololokwi, 1 (Heller); Mtheka Hill, near Ulu, 1 (Johnston); Nairobi, 6 (McMillan, White); Northern Guaso Nyiro River, 1 (K. Roosevelt); Ulu, 7 (Rainey); Ulukenia Hills, 1 (Rainey); Useri River, 15 miles east of Kilimanjaro, 1 (Abbott); Wami Hill, Kapiti Plains, 3 (T. Roosevelt).

Included in this series are 27 adult specimens, the skulls of which show full maturity. Other almost fully grown animals are, as shown by the sutures of the skulls, not fully matured. There is an excellent series of young of all ages, from tiny kittens to those nearly grown.

The Massai or East African lion is a distinctly light-colored, short-haired race. The males are usually decidedly grayish or light buff in color and are easily distinguished by this character from the darker, more ochraceous, and longer-haired Uganda lion, which ranges southeast to the Loita Plains and Southern Guaso Nyiro River. The females are darker and richer colored than the males and differ from females of the Uganda race only by a slight average paler coloration. The younger animals differ from the immature specimens of *nyanzæ* in the same slight degree. I can find no constant and reliable characters by which the skulls of the two races may be distinguished. In reporting on a collection of mammals from British East Africa in 1910,[1] I referred lions from Nairobi to *Felis leo sabakiensis* Lönnberg, described from Mount Kilimanjaro. With such a large series of skins and skulls as the museum now possesses for study and comparison, I am unable to recognize this race, which was founded on individual characteristics of female specimens.

The range of *Felis leo massaica* as mapped by Roosevelt and Heller[2] includes all of German and British East Africa westward to the shores of Victoria Nyanza; but the excellent series of specimens now preserved in the United States National Museum proves that the lions of the Southern Guaso Nyiro and Sotik are separable from the Nairobi, Kapiti Plains, and Kilimanjaro animals, and are better placed with the form described by Heller from the northern shore of Victoria Nyanza, *Felis leo nyanzæ*. I can not distinguish skins and skulls from the region north of Mount Kenia from specimens killed on the Kapiti Plains and in other southern localities. Lönnberg[3] has referred a specimen from the Northern Guaso Nyiro to the Somaliland race, but our somewhat more plentiful material does not justify such a conclusion. A single skin from the Guas Ngishu Plateau is clearly of the East African rather than of the Uganda form.

While on the whole there is remarkable uniformity in skulls of this lion, there are a few cases of considerable individual variation in size of fully adult examples, as shown in the accompanying tables of

[1] Smithsonian Misc. Coll., vol. 56, No. 2, pp. 1-12. March 31, 1910.
[2] Life-Histories of African Game Animals, vol. 1, p. 227. 1914.
[3] Kungl. Svenska Vet. Handl., vol. 48, No. 5, p. 74. 1912.

GROUP OF EAST AFRICAN LIONS IN UNITED STATES NATIONAL MUSEUM.

FOR EXPLANATION OF PLATE SEE PAGE 181

cranial and dental measurements. Skulls and teeth of females vary much more than do those of males. The range of variation in size of the teeth in lionesses from one locality is startling. There is great variation in the shape and size of the auditory bullæ in skulls from one locality.

Out of seven wild-killed adult males, with manes well grown, only two are "black-maned" lions. A skin collected by Doctor Abbott near Kilimanjaro has the entire mane almost pure black, and one collected by Kermit Roosevelt on the Laikipia Plateau has the mane largely black. From the same localities are yellow-maned lions with scarcely a trace of black in the hair of the head, neck, and shoulders. Several others have slight traces of black in the manes, but the ordinary condition seems to be the almost purely "yellow-maned" type.

The following notes on the type-specimen of *Felis leo massaica* were made by Heller in Berlin:

Type ♂ old, A5586. Skin mounted and on exhibition. Skull perfect except for right side of mandible which is broken in half and the posterior half missing. Sphenoidal sutures closed. Greatest length, 358; condylo-incisive length, 320; zygomatic breadth, 328; interorbital breadth, 74; postorbital breadth, 62; nasals 100 × 62; length upper carnassial, 38; length of mandible, 240; width audital bullæ in front, 35; width foramen magnum, 27; height of foramen magnum, 22.

One of the most interesting results of the study of the large series of lions now preserved in the museum is the discovery of the definite variations existing between wild-killed animals and those which have been reared in captivity. This has been described in detail in a special paper.[1] An outline of the most important features of this paper is given below.

Lions in zoological parks are often dealers' specimens without definite history, or animals born in captivity; but in the series of specimens of *Felis leo massaica* in the National Museum collection are five adult lions which were captured as small cubs in the region near Nairobi, in practically the same locality where many of our wild-killed specimens were obtained. They were presented to the National Zoological Park by Mr. W. N. McMillan, and are known as the "McMillan lions." At the time of their arrival in Washington they were from 22 to 30 months old. All of these lions were adult at the time of death and four of them lived to complete maturity, or from six years and two months to seven years and eight months of age.

In addition to giving reliable information as to the age when lions reach full maturity, with the skull fully developed, the basisphenoid suture ankylosed, and the sagittal crest completely formed, these specimens furnished an opportunity for direct comparison between wild-killed and park-reared specimens known to be of the

[1] Some Effects of Environment and Habit on Captive Lions, Proc. U. S. Nat. Mus., vol., 53, pp. 177–193, pls. 22–25. June 1, 1917.

same age. The latter present a striking case of definite structural modification of the skull by habit. This is accompanied by a change in color, the nature of which is equally definite, but the cause of which is less easy to understand.

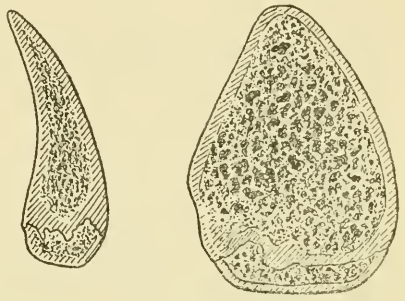
The lions brought from the relatively dry highlands of East Africa became darker in color with each successive moult. The degree of color change was therefore in direct relation to the period of life in Washington. The effect of five years of such life has been to change the color of living examples of *Felis leo massaica* from the normal pale grayish-buff color of the race to a much darker color very much resembling that of *Felis leo nyanzæ*, the lion of the more humid Victoria Nyanza region. The cause of this color change is unknown, though humidity is probably a factor of some importance. Captive lions also develop much finer manes and at an earlier age than do wild animals of the same kind.

Of greater interest in the study of the McMillan lions compared with wild examples from the same region are the modifications in the skulls. In all adult captive animals the skulls have a definite, uniform shape, differing from those of wild-killed lions in a number of conspicuous characters. They are broader and shorter, more massive and bulky, and exhibit abundant relative differences which would be instantly accepted as of "specific" value in wild animals. The obvious reason for the peculiarities of the zoo-reared individuals is that the principal muscles operating the jaws and neck (those muscles used by a wild lion in mauling and killing game, biting, gripping, and shaking) have had so little work to do that they have had relatively little influence in moulding the shape of the bones to which they are attached. In a wild lion which habitually kills quantities of heavy game, these muscles are much used, and in a normal way they mould the growing skull.

The most conspicuous peculiarities of the McMillan lion skulls, and of other zoo-reared lions as well, are the greater (relative and actual) zygomatic breadth, the large rostra, and the great distance across the base of the skull at the mastoids. While actually measuring less in condylobasal or greatest length than many of the wild *massaica* skulls of equal age, they have a far greater zygomatic breadth than any, averaging about 30 millimeters more in males, and 20 millimeters more in females. (See detailed measurements, pages 166–167, and plates 52–54.) The different regions of the skull may be compared in detail:

*Regions of attachment of the masseter muscle.*—Contrary to the usual textbook definition of its function, the masseter muscle unquestionably furnishes the chief gripping power; it is the one most exercised during use of the canine and incisor teeth. While there is intimate relationship between the functions of the masseter and temporal muscles, and the two masses are actually connected, each nevertheless

is the prime factor in the definite mechanical action of separate parts of the dental row. While the masseter, as stated above, has primarily to do with the front teeth (the canines and incisors), the temporal is chiefly concerned with the molar-premolar row, and the process of cutting and chewing rather than biting and gripping. The lion, like all cats, is a biting animal of the highest type. The masseter, aided by the temporal and internal pterygoid muscles, locks the jaw and makes the grip firm. It is attached to almost the entire length of the inner side of the zygoma, from just back of the molar tooth to the pit on the upper side of the squamosal root, and to the ventral half of the outer surface from near the maxillary tuberosity to near the glenoid surface. The region of its origin in the McMillan skulls is greatly changed from the wild type. The malar and the zygomatic process of the temporal bone have been almost uninfluenced by the muscle and have to a certain degree retained distinctive characters of juvenility. In wild lions this muscle has exercised very great influence on the bones of the zygomatic arch. The following characters, which appear to be largely due to the nonaction of this muscle, separate easily the McMillan lion skulls of either sex from wild skulls of equal age: Zygoma more spreading anteriorly; malar very thick and wide; squamosal arm subterete and heavy, almost rounded in cross section and not at all concave on inner surface, with no superior margin for strong muscle attachment [in skulls of wild-killed specimens the squamosal arm of the zygoma is thin and light, but strong; it is greatly hollowed out on inner surface and has a sharp superior margin]. The region of insertion, the outer lateral face of the ascending mandibular ramus, is also greatly modified. In the McMillan skulls it is comparatively heavy and thick, but is smooth and poorly fitted for muscle attachment. The margin is smooth and rounded. The great zygomatic breadth of the skull of the captive lion is partly due to the rounded squamosal arm.



2 3

FIGS. 2-3.—CROSS SECTIONS OF ZYGOMATA OF WILD-KILLED AND PARK-REARED LION SKULLS, MADE AT INFERIOR POINT OF ZYGOMATICO-TEMPORAL SUTURE.—(2) WILD-KILLED (No. 155443, NAIROBI, BRITISH EAST AFRICA); (3) PARK-REARED (No. 199707, "MCMILLAN LION.") ADULT MALES OF EQUAL AGE. NAT. SIZE.

*Regions of attachment of the temporal muscle.*—The chief function of the temporal muscles is to apply to the cheek teeth the power needed for the crushing and cutting up of the food killed by the canines and incisors. As the lions in the Zoological Park are always fed with pieces of meat containing large bones, in order to guard against the

natural tendency of carnivores to bolt their food without chewing, the temporal muscles are used by them in an essentially normal way. These muscles, unlike the disused masseters, have moulded the parts of the growing skull to which they are attached in more nearly the same manner as in wild individuals. The region of origin, the entire side of the skull posteriorly, is somewhat modified. The braincase has been less subjected to pressure by these powerful muscles than in the wild lion, and it, as a consequence, is less compressed laterally. Wild lion skulls of equal age have smaller braincases, and more sharply marked sagittal and lambdoidal crests. The region of insertion, the inner surface of the ascending ramus, is slightly smoother in the McMillan skulls, but is little modified.

*The mastoid and occipital regions.*—These regions are, except for the squamosal arm of the zygoma, the most modified parts of the park-reared lion skulls. The change from the uniform type found in the wild lion is very great. The mastoid breadth in the McMillan lions is far greater than is usual in wild skulls of equal age; the mastoids are broad and spreading, with the large, smooth, postero-external surfaces next to the paroccipital process only slightly turned forward from the general occipital plane, and without sharply marked marginal ridges [in wild lions the mastoid breadth is usually much less, the sides are drawn in and forward, so that the postero-external surfaces of the mastoids lie in a position at a much greater angle from the general occipital plane; marginal ridges sharply recurved; paroccipital process longer and more angular]. (See pl. 55.)

Nondevelopment of the muscles chiefly used in lifting and shaking prey and the consequent lack of necessity for strong attachments is clearly responsible for this peculiarity in the park-reared animals. The splenius, complexus, rhomboideus capitis, cleido-mastoid, sterno-mastoid, rectus capitis posticus major, and rectus capitis posticus minor all attach to the affected parts. A powerful splenius is necessary in the wild lion, as the beast commonly carries heavy prey for long distances; the well-developed rhomboideus capitis aids in this work. The complexus and mastoid muscles are of great power in the shaking process and are, like the splenius and other closely related muscles, naturally less developed in the animal reared in captivity. The digastric muscle, of quite another function, but powerfully developed in the cat, and having its origin on the paroccipital process and inward, bordering the posterior margin of the auditory bullæ, is no doubt somewhat responsible for the development of shape in this part of the skull as well. After a preliminary movement of the hyoid muscles, it is the chief agent for depressing the jaw. The cephalo-humeral and other muscles and the ligamentum nuchæ attach to the base of the skull, but in this problem are of little importance.

The mastoid breadth in a wild-killed adult male lion from Nairobi (No. 155443) is 135 millimeters; in a McMillan lion of the same age (No. 199707) it is 152.

The lambdoidal ridge and occipital bones are broader in the McMillan skulls than in any skulls of wild lions. Here again the splenius and complexus muscles, through nondevelopment, have failed to influence the bone as in a normal wild lion whose life is one of tearing and shaking of strong prey.

*Capacity of the braincase.*—As stated above, external measurements of the braincase in wild lions are less than in park-reared animals of equal age. The capacity of the braincase, however, is considerably greater. Young adults of each, as usual among carnivores, have greater braincase capacity than old or aged adults. The bones forming the cranium of the zoo lion are thicker, and the actual size of the brain is less than in wild-killed examples. In the case of the McMillan lions the capacity is about 50 cubic centimeters less in males and about 40 less in females, than in wild-killed examples of equal age from the same locality.

The "Richardson lion," from the New York Zoological Park, celebrated as the record skull for greatest breadth, and the Menelik lion, the type-specimen of *Felis leo roosevelti*, are both park-reared animals of uncertain history but they show the skull characters of captive lions to a marked degree. Even the skulls of these enormous lions have less braincase capacity than any wild-killed examples of the East African lion.

Following are some measurements of the capacity of the braincase in fully adult lions:

MALES.

| History. | No. | Name. | Locality. | Cc. |
|---|---|---|---|---|
| Wild-killed | 155443 | *Felis leo massaica* | Nairobi | 265 |
| Do | 182297 | do | Kapiti | 265 |
| Do | 182332 | do | do | 285 |
| Park-reared | [1] 199707 | do | Nairobi | 215 |
| Do | [1] 197944 | do | do | 220 |
| Do | 38246 | "Richardson lion" | | 250 |
| Do | 144054 | "Menelik lion" | [Abyssinia] | 255 |

FEMALES.

| | | | | |
|---|---|---|---|---|
| Wild-killed | 182309 | *Felis leo massaica* | Ulu | 245 |
| Do | 182326 | do | Kapiti | 255 |
| Do | 182421 | do | do | 245 |
| Park-reared | [1] 197137 | do | Nairobi | 190 |
| Do | [1] 199524 | do | do | 215 |

[1] McMillan lions. These are the only park-reared skulls strictly comparable with wild-killed *F. l. massaica*.

The following notes on some interesting habits of lions, as observed by the Smithsonian African Expedition, are taken from the chapter on this animal in Roosevelt and Heller's Life-Histories of African Game Animals.[1]

The lion is common throughout all the portions of East Africa which we visited except on the high, wet plateaux and in the dense forests; we did not come across it in Uganda; but it was found on the Lado and less commonly along the White Nile to the Sobat. There are geographical varieties; but the presence or absence of the mane, and its color—black, tawny, or mixed—represent individual and not specific or subspecific variation; black and yellow-maned lions come from the same litter, and the fullness of the mane may vary greatly among males from the same litter, althongh it is apt to be heaviest where the climate is cold.

The litters are certainly born at various times. Judging by the cubs we saw, one litter must have been produced by a lioness on the Kapiti Plains in January, and another on the upper Guaso Nyiro of the north about the first of June; and in each there were in the immediate neighborhood of the litters of comparatively young cubs—three or four months old—other young lions probably three or four months older. This must mean that in East Africa litters may be born at almost any season of the year. The lying-in place of the lioness is sometimes in a cave, sometimes in thick brush or long grass. Normally the cubs remain where they were born for a few weeks, the mother leaving them to hunt, and returning sometimes after an absence of forty-eight hours; but they make no noise even when left thus long. If game is abundant they may keep to the original lair for several months, but if game is scarce, or for other reasons, the lioness may shift her quarters when her young ones are not much bigger than tom-cats, and the family may then be seen travelling long distances until another suitable place for a lair is reached. When the cubs are three months or so old, they habitually travel with the mother; then, instead of eating her fill at a kill and afterward returning to the cubs, the latter run up to the kill and feed at it with their mother. We found flesh and hair in the stomachs of two cubs; for they begin to eat flesh long before they stop suckling. While still very young they try, in clumsy fashion, to kill birds and small animals. By the time they are four or five months old they sometimes endeavor to assist the mother when she has pulled down some game which is not formidable, but has not killed it outright before they come up; and soon afterward they begin to try regularly to help her in killing, and they speedily begin to help her in hunting and to attempt to hunt for themselves. Evidently in their first attempts they claw and bite their prey everywhere; for we found carcasses of zebra and hartebeest thus killed by family parties which were scarred all over.

Lions are sometimes monogamous and sometimes polygamous, and there is much variety in the way they conduct their family life. It is a common thing for an old male to be found alone, and it is no less common for two adult males to be found in company, living and hunting together; the two famous man-eaters of Tsavo, which for a time put a complete stop to the building of the Uganda Railroad, were in the latter category. A lion and a lioness are often found together, and in such case a strong attachment may be shown between them, and the union be apparently permanent; at least this would seem to be the case from the fact that such pairs will often remain together just before the birth of the cubs and while the latter are very little, the lion lying up during the day in the neighborhood of his mate and her litter. But it is a frequent thing to find a party of lions consisting of one old male, of two or three or four females, and of the cubs of some of the latter; and these parties are well known to the Ukamba and 'Ndorobo hunters, and their association is permanent, so that

[1] Life-Hist. Afr. Game Animals, vol. 1, pp. 164–167, 169. 1914.

these cases evidently afford instances of polygamy. Two or three lionesses sometimes live in companionship, with perhaps the cubs of one or more of them; and a single lioness may be found either by herself or with the cubs of one litter, or of two litters. On one occasion we found a lioness associating with a young male, not yet quite fully grown but already much bigger than she was, and a couple of young cubs perhaps two or three months old; now, from information given us by the natives, we are inclined to think (although, of course, we are not certain) that the young male was one of her cubs of a former litter, and the father of the cubs that were with them. Finally, it may happen that lions join temporarily in larger parties, which may contain two or three adult males, several females, and young animals of various ages; but we are inclined to believe that these associations are short-lived, being due to peculiar conditions, such as great local abundance of game—for lions often hunt together in order to profit by mutual support. * * *

Lions do not go into heavy forests, although they make their day lairs along the edges. They like to lie up for the day in patches of jungle which border on open plains; in bushes in open scrub; in clumps of reeds; in any thick bit of cover in the open thorn forests which are so plentiful in much of the game country; and perhaps especially in a strip of cover along a river, or one of the dense masses of brush and trees, of small extent, which are found along the watercourses. They also lie in tall grass. Occasionally they lie, throughout the day, right out in the open, on a mound or the side of an ant-hill, or under a low bush or tree that does not shield them from sight. If the grass is very tall they find it easy to get close to their prey and to evade human observation; and where the brush is thick or the open forest fairly continuous it is almost a chance if one comes on them. If much molested they become strictly nocturnal; otherwise, under more natural conditions, although they spend most of the day sleeping, they may sometimes be seen leisurely strolling in the open, and they often return to their resting-places after sunrise, and leave them before sunset—although even under such circumstances it is only exceptionally that they hunt except under cover of darkness. Once we came on a big male lion in mid-afternoon walking back across the open plain to a zebra he had killed on the previous night; and once, at the same time of day, we came on a lioness leading her cubs back to the carcass of a wildebeest, also slain over night. On another afternoon we came across a lion and lioness gazing intently at an old bull wildebeest which was returning their stare, very much on the alert, at a distance of sixty yards.

For measurements of specimens see tables, pages 166-169.

FELIS LEO NYANZÆ Heller.

1910. *Felis leo massaica* Roosevelt, Afr. Game Trails, Amer. ed., p. 476; London ed., p. 487. (Part.)

1913. *Felis leo nyanzæ* Heller, Smithsonian Misc. Coll., vol. 61, No. 19, p. 4. November 8. (Kampala, Uganda; type in U. S. Nat. Mus.)

1914. *Felis leo nyanzæ* Roosevelt and Heller, Life Hist. Afr. Game Animals, vol. 1, p. 226.

1917. *Felis leo nyanzæ* Hollister, Proc. U. S. Nat. Mus., vol. 53, p. 183. June 1.

*Specimens.*—Forty, from the following localities:

Uganda: Kampala, 1, the type (T. Roosevelt).

British East Africa: Kabalolot Hill, Sotik, 6 (Rainey); Lime Springs, Sotik, 5 (Rainey, Johnston); Loita Plains, 9 (Rainey, Heller, Johnston); Njoro Osolali, Sotik, 2 (T. Roosevelt, K. Roosevelt); Southern Guaso Nyiro River, 6 (T. Roosevelt, Loring, Mearns); Telek River, 7 (Rainey, Johnston, Heller).

GERMAN EAST AFRICA: Western edge Serengeti Plains, near head of the Mbalageti River, 4 skulls (Elton Clark, Lindsay).

The Uganda lion, whose range extends along the shores of Victoria Nyanza and eastward to the Southern Guaso Nyiro River in British East Africa, is a darker, richer colored, and longer haired animal than the lion of the Kapiti Plains and Kilimanjaro regions. The type skin of *nyanzæ* has been considerably darkened by stain, apparently from red soil and also from some native tanning process. This has reddened all the lighter parts on the face, head, and limbs. The skin was presented to Colonel Roosevelt by the European residents at Kampala and has not been re-dressed by museum taxidermists or tanners. The Sotik lion skins are all of the same dark race, and allowing for the undoubted darkening of some of the lighter parts on the type, are almost precisely of the same shade of color.

A maned male of this form, killed by Kermit Roosevelt in the Sotik, weighed 412 pounds. Another large male, also maned, shot by Colonel Roosevelt in the same region, weighed 410 pounds. Both of these animals were thin. All of the adult males of this form in the collection are "yellow-maned," with little trace of black in the longer hairs of the head and neck. The young of *Felis leo nyanzæ* are even more spotted on the underparts, legs, and feet than are the young of *F. l. massaica*. There is the same great variation in size of skull and teeth in the lioness as in *massaica*.

For measurements see tables, pages 166–169.

### FELIS LEO SOMALIENSIS Noack.

1891. [*Felis leo*] var. *somaliensis* NOACK, Jahrb. Hamburgischen Wiss. Anst., vol. 9, 1st half, p. 120. ("Somaliland.")

*Specimen.*—One, as follows:

"SOMALILAND" (Gross).

This race of the lion was described from a pair of animals living in the Berlin Zoological Gardens. The exact history of the specimens is somewhat in doubt, and according to Heller[1] the animals have since been traded to other zoological parks, and all trace of them has been lost. Our specimen is an animal which died in the National Zoological Park in Washington, and it exhibits all the usual characteristics of color and skull found in lions reared in captivity. For this reason it is valueless for systematic purposes.

A lioness from Somaliland now living in the National Zoological Park is distinctly smaller than the average lioness from British East Africa. The subspecies seems to be well marked and it is greatly to be hoped that wild-killed specimens may before long reach the Museum.

[1] Roosevelt and Heller, Life-Hist. Afr. Game Anim., vol. 1, p. 224. 1914.

### FELIS LEO ROOSEVELTI Heller.

Plate 43.

1913. *Felis leo roosevelti* Heller, Smithsonian Misc. Coll., vol. 61, No. 19, p. 2. November 8. ("Highlands of Abyssinia near Addis Ababa;" type in U. S. Nat. Mus.)

1914. *Felis leo roosevelti* Roosevelt and Heller, Life-Hist. Afr. Game Anim., vol. 1, map, p. 227.

1917. *Felis leo roosevelti* Hollister, Proc. U. S. Nat. Mus., vol. 53, pp. 186, 188, 192, June 1.

*Specimens.*—Four, from localities as follows:

Sudan: Omdurman, 1 (Wingate).

Abyssinia: "Abyssinia," 2 (Menelik, Nat. Zoo. Park): Harrar, 1 (Nat. Zoo. Park).

All of these four specimens are animals which have died in the Zoological Park, and all show the unmistakable characteristics of bone and color usual to lions reared in captivity. They are therefore valueless for systematic work.

The status of this subspecies is greatly in doubt. The type-specimen was presented by King Menelik of Abyssinia to President Roosevelt in 1904 and was deposited in the National Zoological Park in March of that year. It died November 14, 1906. In describing the race, Heller assumed that this animal was captured near Addis Ababa and that it was fully grown when taken by the Abyssinians. Both of these assumptions are apparently groundless, as the skull shows unquestionably that the lion lived his life in captivity from early adolescence. The locality "Addis Ababa" is not entered in the museum records, and there is every chance that the lion was brought to the Emperor as a kitten by some of his subjects living in some far-distant corner of Abyssinia. The skull almost exactly agrees with the old male skulls of the McMillan lions from Nairobi, British East Africa, which died in the National Zoological Park, and can not be separated subspecifically from them. It differs from all the wild-killed skulls of *Felis leo massaica* exactly as these McMillan skulls differ from wild-killed lion skulls from the vicinity of Nairobi.[1] The skin is dark and richly colored and has a splendid mane, but, as stated before, these are characteristics of zoological park lions. All the characters used in separating the race, then, are those common to specimens of *massaica* reared in captivity, and it might be argued that since the type specimen of *roosevelti* might well have originally been captured within the habitat of *massaica* the name should be placed in the synonymy of the latter form. There are few specimens of wild-killed Abyssinian lions in collections, and great effort should be made to obtain such material before it is too late.

[1] See Hollister, Some Effects of Environment and Habit on Captive Lions, Proc. U. S. Nat. Mus., vol. 53, pp. 177–193. June 1, 1917.

*Measurements of skulls of adult lions from East Africa.*

| Form and locality. | No. | Sex. | Condylobasal length. | Greatest length. | Zygomatic breadth. | Mastoid breadth. | Interorbital constriction. | Rostral breadth over canine. | Lachrymal foramen to alveolar point. | Greatest length nasals. | Mandible. | Front of upper canine to back of $pm^4$. | Front of lower canine to back of $m_1$. | Observations. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *F. l. massaica.* | | | | | | | | | | | | | | |
| British East Africa: | | | | | | | | | | | | | | |
| Mount Kilimanjaro | 174742 | Male | 318 | 351 | 241 | 132 | 68 | 94 | 132 | 104 | 241 | 109 | 126 | Basal suture obliterated. |
| Kapiti Station | 182297 | do | 322 | 373 | 248 | 135 | 71 | 100 | 140 | 110 | 257 | 112 | 128 | Do. |
| Do | 182332 | do | 328 | 372 | 228 | 138 | 70 | 93 | 139 | 112 | 253 | 112 | 128 | Basal suture open. |
| Ulu Station | 182307 | do | 324 | ..... | 230 | 142 | 71 | 91 | 139 | 111 | 249 | 113 | 128 | Do. |
| Ulukenia Hills | 182313 | do | ..... | ..... | 236 | ..... | 72 | 95 | 135 | 101 | 244 | 110 | 127 | Do. |
| Nairobi | 155443 | do | 335 | 373 | 234 | 135 | 70 | 92 | 146 | 118 | 256 | 116 | 133 | Basal suture obliterated. |
| Laikipia Plat | 163328 | do | 316 | 337 | 233 | 133 | 75 | 92 | 139 | 107 | 235 | 112 | 127 | Do. |
| Nairobi [1] | 197944 | do | 309 | 345 | 261 | 146 | 78 | 96 | 136 | 97 | 248 | 108 | 127 | Do. |
| Do | 199707 | do | 325 | 363 | 264 | 152 | 80 | 104 | 139 | 101 | 260 | 113 | 131 | Do. |
| *F. l. nyanzæ.* | | | | | | | | | | | | | | |
| British East Africa: | | | | | | | | | | | | | | |
| Lime Springs, Sotik | 181568 | Male | 295 | 334 | 216 | 131 | 67 | 93 | 127 | 102 | 233 | 104 | 120 | Basal suture open. |
| Do | 181569 | do | 318 | 345 | 211 | 124 | 68 | 94 | 132 | 96 | 238 | 106 | 118 | Do. |
| Do | 181570 | do | ..... | ..... | 229 | 137 | 68 | 92 | 133 | 98 | 244 | 105 | 122 | |
| Do | 181571 | do | 324 | 368 | 243 | 135 | 71 | 98 | 137 | 114 | 255 | 108 | 125 | Basal suture closed. |
| Kabalolot Hill | 181573 | do | ..... | ..... | 221 | ..... | 65 | 91 | 126 | 101 | 241 | 107 | 123 | |
| Do | 181574 | do | 322 | 352 | 226 | 131 | 67 | 91 | 138 | 103 | 244 | 106 | 118 | Basal suture open. |
| Telek River | 181577 | do | 318 | 356 | 235 | 132 | 70 | 93 | 132 | 103 | 245 | 109 | 125 | Basal suture closed. |
| So. Guaso Nyiro Riv | 162913 | do | 329 | 371 | 251 | 144 | 74 | 98 | 136 | 106 | 255 | 114 | 132 | Do. |
| Njoro Osolali | 162919 | do | 321 | 356 | 235 | 132 | 66 | 92 | 133 | 104 | 242 | 111 | 128 | Basal suture obliterated. |
| *F. l. roosevelti.* | | | | | | | | | | | | | | |
| Abyssinia: | | | | | | | | | | | | | | |
| "Adis Ababa" [1] | [2] 144054 | Male | 295 | 333 | 255 | 132 | 69 | 94 | 129 | 95 | 237 | 105 | 124 | Basal suture obliterated. |
| Harrar [1] | 174639 | do | 308 | 333 | 246 | 127 | 70 | 89 | 131 | 98 | 234 | 104 | 118 | Do. |

| | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *F. l. massaica.* | | | | | | | | | | | | | | |
| British East Africa: | | | | | | | | | | | | | | |
| Mount Kilimanjaro | 174744 | Female | 270 | 301 | 195 | 116 | 60 | 79 | 111 | 88 | 207 | 94 | 108 | Basal suture obliterated. |
| Ulu Station | 182308 | ...do | 259 | 290 | 195 | 115 | 58 | 80 | 111 | 90 | 202 | 93 | 110 | Do. |
| Do | 182309 | ...do | 280 | 306 | 195 | 122 | 56 | 85 | 115 | 89 | 210 | 98 | 115 | Basal suture open. |
| Do | 182311 | ...do | 262 | 285 | 195 | 114 | 57 | 77 | 110 | 88 | 204 | 91 | 107 | Do. |
| Kapiti Station | 182293 | ...do | 264 | 294 | 203 | 120 | 63 | 81 | 111 | 86 | 203 | 96 | 108 | Basal suture obliterated. |
| Do | 182324 | ...do | 266 | 299 | 185 | 111 | 57 | 78 | 115 | 90 | 200 | 94 | 108 | Do. |
| Do | 182326 | ...do | 267 | 299 | 204 | 117 | 60 | 80 | 113 | 91 | 210 | 95 | 108 | Do. |
| Do | 182421 | ...do | 262 | 292 | 192 | 119 | 58 | 76 | 110 | 88 | 203 | 93 | 106 | Do. |
| Do | 182423 | ...do | 254 | 282 | 180 | 112 | 54 | 74 | 106 | 80 | 198 | 91 | 105 | Do. |
| Wami Hill | 161914 | ...do | 258 | 291 | 192 | 114 | 58 | 77 | 108 | 86 | 196 | 91 | 104 | Do. |
| Kitanga | 182315 | ...do | | | | | 58 | 80 | 110 | 90 | 197 | 93 | 106 | |
| Laikipia Plat | 163109 | ...do | 269 | 295 | 195 | 112 | 67 | 81 | 116 | 97 | 212 | 98 | 115 | Do. |
| Do | 163329 | ...do | 273 | 307 | 193 | 115 | 60 | 81 | 121 | 100 | 209 | 99 | 115 | Do. |
| N. Guaso Nyiro Riv | 163108 | ...do | 264 | 298 | 195 | 112 | 64 | 81 | 117 | 93 | 200 | 98 | 112 | Do. |
| Nairobi[1] | 197137 | ...do | 265 | 291 | 209 | 120 | 59 | 81 | 115 | 89 | 200 | 93 | 105 | Do. |
| Do | 199524 | ...do | 265 | 300 | 224 | 119 | 64 | 84 | 112 | 87 | 206 | 92 | 104 | Do. |
| *F. l. nyanzæ.* | | | | | | | | | | | | | | |
| British East Africa: | | | | | | | | | | | | | | |
| Loita Plains | 181589 | Female | 269 | 296 | 202 | 117 | 62 | 80 | 117 | 87 | 208 | 95 | 109 | Basal suture obliterated. |
| Do | 181590 | ...do | 253 | 280 | 185 | 107 | 57 | 73 | 106 | 82 | 195 | 91 | 106 | Basal suture closed. |
| Do | 181592 | ...do | 273 | 306 | 205 | 112 | 64 | 81 | 118 | 94 | 210 | 100 | 114 | Basal suture obliterated. |
| Kabalolot Hill | 181572 | ...do | 266 | 291 | 187 | 109 | 62 | 81 | 115 | 92 | 207 | 98 | 111 | Do. |
| Do | 181930 | ...do | 264 | 300 | 206 | 115 | 61 | 84 | 114 | 92 | 206 | 99 | 111 | Do. |
| Telek River | 181578 | ...do | 256 | 284 | 180 | 105 | 58 | 75 | 109 | 85 | 196 | 94 | 107 | Do. |
| Do | 181583 | ...do | 278 | 309 | 202 | 117 | 63 | 86 | 117 | 98 | 211 | 99 | 115 | Do. |
| Njoro Osolali | 162916 | ...do | 281 | 313 | 204 | 123 | 66 | 88 | 121 | 93 | 212 | 102 | 113 | Do. |
| So. Guaso Nyiro Riv | 162914 | ...do | 254 | 277 | 185 | 113 | 56 | 75 | 99 | 79 | 199 | 94 | 114 | Do. |
| Do | 162915 | ...do | 268 | 299 | 203 | 118 | 54 | 84 | 110 | 89 | 205 | 95 | 110 | Do. |
| Do | 162917 | ...do | 272 | 302 | 196 | 115 | 60 | 80 | 111 | 89 | 208 | 98 | 111 | Do. |
| Do | 162918 | ...do | 261 | 285 | 198 | 113 | 55 | 89 | 107 | 87 | 203 | 94 | 106 | Do. |
| *F. l. somaliensis.* | | | | | | | | | | | | | | |
| Somaliland[1] | 153525 | Female | | 289 | 213 | 111 | 60 | 81 | 115 | 82 | 202 | 90 | 106 | Basal suture obliterated. |

[1] Reared in captivity.

[2] Type.

*External and dental measurements of adult lions from East Africa.*

| Form and locality. | No. | Sex. | Head and body. | Tail vertebræ. | Hind foot. | Ear. | Alveolar length of upper canine. | Upper carnassial. | Second upper premolar. | Lower molar. |
|---|---|---|---|---|---|---|---|---|---|---|
| *F. l. massaica.* | | | | | | | | | | |
| British East Africa: | | | | | | | | | | |
| Mount Kilimanjaro | 174742 | Male | | | | | 26.2 | 35.4×16.4 | 25.2×13.0 | 25.6×13.3 |
| Kapiti Station | 182297 | .....do | | | | | 27.8 | 40.0×19.9 | 27.5×13.5 | 28.6×15.3 |
| Do | 182332 | .....do | | | | | 26.5 | 37.8×19.2 | 27.2×13.7 | 28.7×14.5 |
| Ulu Station | 182307 | .....do | | | | | 24.5 | 37.8×18.8 | 26.7×13.9 | 28.5×14.2 |
| Ulukenia Hills | 182313 | .....do | | | | | 26.9 | 41.5×21.1 | 28.5×15.4 | 28.9×15.3 |
| Nairobi | 155443 | .....do | | | | | 27.8 | 39.3×18.9 | 27.3×14.0 | 28.8×14.5 |
| Laikipia Plat | 163328 | .....do | | | | | 24.4 | 38.0×19.1 | 27.3×12.1 | 27.7×13.6 |
| Nairobi [1] | 197944 | .....do | | | | | 23.0 | 35.8×18.1 | 24.0×13.4 | 28.2×13.9 |
| Do | 199707 | .....do | | | | | 25.2 | 37.9×19.7 | 25.8×13.0 | 27.6×14.7 |
| *F. l. nyanzæ.* | | | | | | | | | | |
| British East Africa: | | | | | | | | | | |
| Lime Springs, Sotik | 181568 | Male | 1630 | | 315 | 130 | 27.3 | 37.7×19.3 | 25.3×12.5 | 28.8×14.8 |
| Do | 181569 | .....do | 1760 | 980 | 355 | 133 | 26.8 | 36.6×16.3 | 24.2×12.0 | 27.7×13.9 |
| Do | 181570 | .....do | 1730 | | 355 | 140 | 27.4 | 38.1×17.2 | 25.8×12.3 | 29.8×14.5 |
| Do | 181571 | .....do | | 980 | 375 | 132 | 27.9 | 40.8×19.5 | 26.2×12.9 | 30.6×15.2 |
| Kabalolot Hill | 181573 | .....do | 1720 | 1010 | 370 | 120 | 26.3 | 38.5×17.9 | 24.9×12.0 | 28.7×14.2 |
| Do | 181574 | .....do | | 930 | 340 | 128 | 24.3 | 35.3×17.4 | 24.5×12.9 | 24.9×12.8 |
| Telek River | 181577 | .....do | 1835 | 914 | 375 | 145 | 26.1 | 37.3×18.8 | 25.4×12.2 | 28.8×14.0 |
| South Guaso Nyiro River | 162913 | .....do | 1950 | 1030 | 385 | 145 | 26.7 | 37.9×19.4 | 25.1×13.8 | 28.2×15.2 |
| Njoro Osolali | 162919 | .....do | | 930 | 365 | | 27.5 | 39.7×18.5 | 24.6×13.2 | 30.6×14.8 |
| *F. l. roosevelti.* | | | | | | | | | | |
| Abyssinia: | | | | | | | | | | |
| "Adis Ababa" [1] | [2] 144054 | Male | [3] 1780 | 760 | 350 | | 23.1 | 34.3×17.3 | 24.7×11.8 | 25.6×12.4 |
| Harrar [1] | 174639 | .....do | | | | | 24.9 | 34.8×21.9 | 23.7×12.5 | 25.0×12.5 |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| *F. l. massaica.* | | | | | | | | | | |
| British East Africa: | | | | | | | | | | |
| Mount Kilimanjaro | 174744 | Female | | | | | 21.8 | 34.0×16.2 | 23.7×11.5 | 24.2×12.3 |
| Ulu Station | 182308 | .....do | | | | | 23.6 | 35.4×17.7 | 23.8×11.7 | 25.1×12.7 |
| Do | 182309 | .....do | | | | | 24.9 | 38.5×19.4 | 27.7×14.1 | 28.4×14.6 |
| Do | 182311 | .....do | | | | | 20.7 | 33.6×15.9 | 22.3×11.5 | 24.6×13.2 |
| Kapiti Station | 182293 | .....do | | | | | 21.9 | 35.2×17.1 | 23.7×12.9 | 25.3×13.9 |
| Do | 182324 | .....do | | | | | 20.9 | 33.9×16.8 | 23.6×11.7 | 25.3×12.4 |
| Do | 182326 | .....do | | | | | 19.4 | 33.2×15.5 | 22.1×11.2 | 23.9×12.1 |
| Do | 182421 | .....do | | | | | 21.9 | 32.5×16.3 | 23.1×12.2 | 23.3×12.7 |
| Do | 182423 | .....do | | | | | 21.2 | 33.1×17.0 | 21.8×12.5 | 24.6×13.6 |
| Wami Hill | 161914 | .....do | 1560 | 820 | 325 | 127 | 21.7 | 33.4×15.6 | 21.7×11.1 | 24.2×12.1 |
| Kitanga | 182315 | .....do | | | | | 23.2 | 35.6×16.5 | 22.2×12.0 | 25.6×13.2 |
| Laikipia Plat | 163109 | .....do | | | | | 23.5 | 33.2×17.5 | 24.2×12.8 | 25.1×13.2 |
| Do | 163329 | .....do | | | | | 21.2 | 33.9×17.4 | 22.9×12.1 | 25.9×12.9 |
| North Guaso Nyiro River | 163108 | .....do | | | | | 22.8 | 35.0×17.3 | 25.7×13.2 | 25.6×12.9 |
| Nairobi [1] | 197137 | .....do | 1410 | 724 | 305 | | 19.1 | 33.6×15.2 | 22.9×10.5 | 23.8×11.9 |
| Do | 199524 | .....do | 1621 | 801 | 336 | | 19.2 | 32.5×15.4 | 21.7×11.3 | 22.9×12.4 |
| *F. l. nyanza.* | | | | | | | | | | |
| British East Africa: | | | | | | | | | | |
| Loita Plains | 181589 | Female | 1470 | 910 | 310 | 120 | 21.3 | 33.0×15.3 | 21.9×11.7 | 25.0×12.5 |
| Do | 181590 | .....do | 1520 | 840 | 315 | 110 | 20.2 | 31.8×14.7 | 20.6× 9.6 | 23.6×11.5 |
| Do | 181592 | .....do | 1590 | 960 | 360 | 115 | 22.8 | 34.7×18.0 | 22.6×10.8 | 24.4×13.7 |
| Kabalolot Hill | 181572 | .....do | | 900 | 370 | 118 | 22.5 | 35.3×16.4 | 24.1×12.1 | 25.5×13.7 |
| Do | 181930 | .....do | | | | | 23.3 | 34.4×16.4 | 23.3×11.8 | 25.1×12.9 |
| Telek River | 181578 | .....do | 1490 | 920 | 335 | 122 | 21.3 | 34.5×16.4 | 22.1×11.8 | 25.2×13.0 |
| Do | 181583 | .....do | 1575 | 976 | 325 | 120 | 22.8 | 32.8×15.8 | 23.4×11.7 | 25.2×12.9 |
| Njoro Osolali | 162916 | .....do | | 820 | 340 | 128 | 22.8 | 36.2×17.8 | 24.2×11.7 | 25.5×13.8 |
| South Guaso Nyiro River | 162914 | .....do | | 875 | 330 | 110 | 19.6 | | 22.9×10.7 | 22.7×11.2 |
| Do | 162915 | .....do | | 840 | 330 | 116 | 23.0 | 34.4×17.9 | 22.9×13.3 | 25.7×13.6 |
| Do | 162917 | .....do | | | | | 20.4 | 33.0×16.5 | 23.3×11.7 | 23.4×12.2 |
| Do | 162918 | .....do | | | | | 21.2 | 35.7×17.1 | 23.1×10.7 | 24.9×12.3 |
| *F. l. somaliensis.* | | | | | | | | | | |
| Somaliland [1] | 153525 | Female | | | | | 20.5 | 30.8×16.3 | 21.0×11.1 | 24.1×12.3 |

[1] Reared in captivity.

[2] Type of *Felis leo rooseveltl* Heller.

[3] From tanned skin.

### FELIS PARDUS PARDUS Linnæus.

1758. *Felis pardus* Linnæus, Syst. Nat., ed. 10, p. 41. (Valley of the Nile, Egypt.[1])

*Specimens.*—Two skins, without skulls, from the following localities:

Sudan: El Dueim, 1 (Mearns); Khartoum, 1 (Mearns).

These skins indicate that true *pardus* is a much more ochraceous-buff colored animal than are the upper Nile or East African forms of the leopard. No skulls of typical *pardus* are in the collection, and comparison of the specimens is therefore very unsatisfactory. The Khartoum skin is that of an immature animal; the El Dueim specimen an adult male.

For measurements of specimens of leopards see tables, pages 172–173.

### FELIS PARDUS CHUI Heller.

Plates 44, 45.

1913. *Felis pardus chui* Heller, Smithsonian Misc. Coll., vol. 61, No. 19, p. 6. November 8. (Gondokoro, Uganda; type in U. S. Nat. Mus.)

1914. *Felis pardus chui* Roosevelt and Heller, Life-Hist. African Game Anim., vol. 1, p. 239.

*Specimens.*—Three, as follows:

Lado: Rhino Camp, 1 (Heller).

Uganda: Gondokoro, 7 miles east of, 1 (Heller).

British East Africa: Nzoia River, Guas Ngishu Plateau 1 (K. Roosevelt).

The specimen listed above from the Nzoia River is not typical of *Felis pardus chui* but seems to belong with this form rather than with *suahelica* of the region to the east. It is a rather young adult female which shows characters intermediate between the two forms. In size it is considerably larger than any adult female of *suahelica*, and has a larger skull. The body color and spotting are more like *suahelica* than like *chui*, but the feet have the white ground color of *chui* rather than the yellowish-buff of *suahelica*. The region is just where specimens intermediate between the two forms might be expected to occur, although *suahelica* is found in the Elgoyo forest only a short distance to the east. Adult male leopards from the Nyanza region are greatly desired to work out the interrelations of the two forms. As noted under *Felis pardus suahelica*, specimens of that form from the Naivasha Lake country are larger than those from farther east, and are approaching in that character, but without change in color, the form from the Upper Nile.

The old male from Rhino Camp, Lado, measured 725 millimeters high at shoulder; the female from Guas Ngishu Plateau, 670.

[1] Cabrera, Bol. Real. Soc. española Hist. Nat., 1910, p. 425, November; Thomas, Proc. Zool. Soc. London, 1911, p. 135, March.

### FELIS PARDUS SUAHELICA Neumann.

Plate 5.

1900. *Felis leopardus suahelicus* Neumann, Zool. Jahrb., Syst., vol. 13, p. 551. ("East Africa"; specimens mentioned from Tanga, Manyara Lake, Nai, and Usandawe, German East Africa, and from Loita Hills, British East Africa; and "Uganda." Type locality may be restricted to some point in northeastern German East Africa; cotypes [?] in Berlin Museum.)

1910. *Felis pardus suahelica* Roosevelt, African Game Trails, Amer. ed., p. 476; London ed., p. 487.

1914. *Felis pardus suahelica* Roosevelt and Heller, Life-Hist. African Game Anim., vol. 1, p. 236.

1914. *Felis pardus ruwenzorii* Roosevelt and Heller, Life-Hist. African Game Anim., vol. 1, p. 238. (Part, specimen from Meru; not of Camerano.)

*Specimens.*—Twenty-four, from the following localities:

Somaliland: "Somaliland," 2 (Cunningham).

Abyssinia: Adis Ababa, 1 skin (Philip).

British East Africa: Juja Farm, 1 (K. Roosevelt); Kabalolot Hill, Sotik, 1 (Heller); Kamiti Farm, Athi Plains, 2 (Mearns); Kampi Moto, 20 miles north of Nakuru, 1 (K. Roosevelt); Kapiti Station, 1 (Rainey); Kisii District, 4 odd skulls (Loring); Lake Naivasha, 2 (Heller, Mearns); Meru, 1 (Heller); Rumathe River, Northern Guaso Nyiro, 1 (Heller); Ulu Station, 6 (Rainey, Heller); Voi, 1 skin (Heller).

The two specimens from "Somaliland" died in the National Zoological Park in Washington; the skull of the adult male shows all the characteristic features of a zoo-reared cat, as described under *Felis leo massaica*. These specimens are of little use for systematic purposes; the exact point of capture is unknown. They do not vary enough from ordinary skins of *Felis pardus sauhelica* in size or markings to excite suspicion that they might represent a distinct race, and the skull of the male is fully as large as in *suahelica*. It is quite evident that these specimens do not represent the *Felis pardus nanopardus* of Thomas,[1] described from forty miles west of Gorahai. The skin from Adis Ababa, Abyssinia, is a fine example of the "black" leopard. The markings are plainly traceable, however, and from the size of the spots the form represented is not the *Felis pardus pardus* which occurs at Khartoum, but rather *F. p. suahelica*. Unfortunately, the specimen is without a skull.

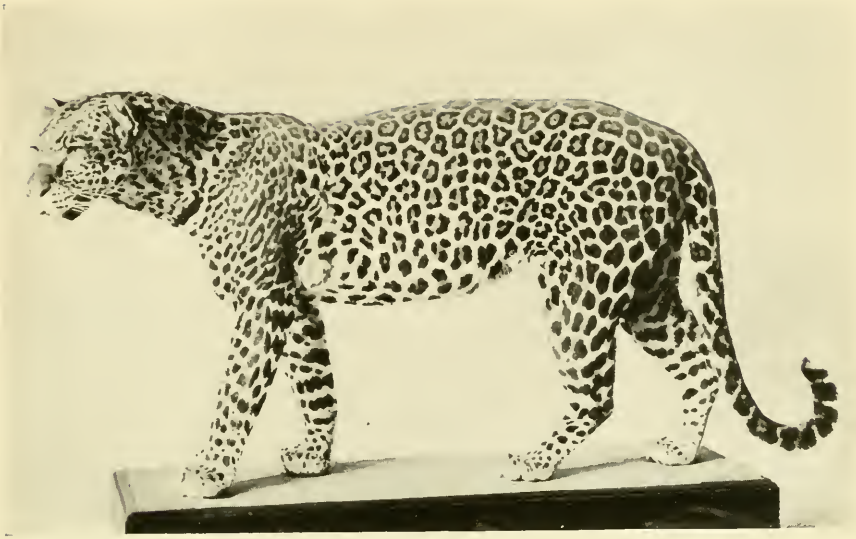
The series of skins and skulls from various parts of British East Africa, except for a few individual specimens, is a very uniform lot in color and size. The two skulls and one skin from Naivasha are somewhat larger than others in the series from southern and central British East Africa and are approaching in this character *Felis pardus chui* of the Upper Nile Valley. In color the skin is typical of *suahelica* and shows no indication of gradation toward *chui*, as does the

[1] Ann. and Mag. Nat. Hist., ser. 7, vol. 14, p. 94. July, 1904.

*Measurements of skulls of leopards from East Africa.*

| Form and locality. | No. | Sex. | Greatest length. | Condylobasal length. | Zygomatic breadth. | Mastoid breadth. | Interorbital constriction. | Rostral breadth over canine. | Lachrymal foramen to alveolar point. | Greatest length nasals. | Mandible. | Front of upper canine to back of $pm^4$. | Front of lower canine to back of $m_1$. | Observations. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *Felis p. chui.* | | | | | | | | | | | | | | |
| Uganda: Gondokoro | [1] 164764 | Male | 243 | 225 | 150 | 94 | 37 | 59 | 84 | 76 | 166 | 76 | 88 | Basal suture obliterated. |
| Lado: Rhino Camp | 164763 | do | 247 | 221 | 153 | 97 | 42 | 59 | 85 | 71 | 165 | 76 | 90 | Do. |
| B. E. A.: Nzoia River | 163093 | Female | 213 | 194 | 129 | 84 | 35 | 50 | 71 | 60 | 139 | 67 | 78 | Basal suture open. |
| *Felis p. suahelica.* | | | | | | | | | | | | | | |
| B. E. A.: | | | | | | | | | | | | | | |
| Ulu | 182329 | Male | 224 | 202 | 137 | 92 | 38 | 54 | 77 | 67 | 146 | 72 | 82 | Do. |
| Kapiti | 182323 | do | 225 | 205 | 144 | 88 | 41 | 58 | 74 | 66 | 147 | 71 | 83 | Basal suture obliterated. |
| Kabalolot Hill | 181595 | do | 220 | 200 | 138 | 90 | 35 | 55 | 75 | 60 | 148 | 71 | 81 | Basal suture closed. |
| Kisii | 162147 | do | 212 | 192 | 138 | 86 | 36 | 52 | 70 | 63 | 140 | 70 | 79 | Basal suture open. |
| Meru | 163095 | do | 220 | 202 | 140 | 90 | 37 | 50 | 73 | 66 | 149 | 72 | 81 | Basal suture obliterated. |
| Rumathe River | 182178 | do | 218 | 201 | 139 | 85 | 41 | 57 | 74 | 62 | 143 | 67 | 78 | Do. |
| Naivasha | 162926 | do | 234 | 209 | 138 | 92 | 39 | 57 | 78 | 70 | 154 | 74 | 86 | Basal suture open. |
| Do | 162927 | do | 238 | 217 | 150 | 95 | 43 | 58 | 82 | 74 | 156 | 74 | 85 | Basal suture obliterated. |
| Ulu | 184818 | Female | 189 | 175 | 124 | 75 | 33 | 45 | 61 | 56 | 125 | 61 | 71 | Do. |
| Do | 184819 | do | 182 | 167 | 110 | 72 | 32 | 44 | 62 | 54 | 120 | 59 | 69 | Do. |
| Juja Farm | 161911 | do | 185 | 170 | 114 | 73 | 31 | 46 | 61 | 54 | 120 | 60 | 68 | Do. |
| Kisii | 162144 | do | 190 | 177 | 120 | 77 | 33 | 47 | 61 | 55 | 124 | 59 | 69 | Basal suture open. |
| Do | 162145 | do | 198 | 180 | 125 | 76 | 34 | 47 | 64 | 59 | 131 | 63 | 70 | Basal suture obliterated. |
| Do | 162146 | do | 197 | 179 | 125 | 78 | 33 | 48 | 64 | 61 | 127 | 62 | 71 | Do. |
| Kampi Moto | 163094 | do | 192 | 176 | 126 | 79 | 34 | 50 | 65 | 60 | 131 | 63 | 72 | Do. |
| *F. fortis.* | | | | | | | | | | | | | | |
| B. E. A.: Loita Plains | [1] 181600 | Male | 260 | 236 | 157 | 104 | 43 | 64 | 85 | 76 | 173 | 81 | 90 | Do. |

[1] Type specimen.



UPPER FIGURE, EAST AFRICAN LEOPARD; LOWER FIGURE, RAINEY'S CHEETAH.

FOR EXPLANATION OF PLATE SEE PAGE 181.

*External and dental measurements of adult leopards from East Africa.*

| Form and locality. | No. | Sex. | Head and body. | Tail vertebræ. | Hind foot. | Ear. | Alveolar length of upper canine. | Upper carnassial. | Second upper premolar. | Lower molar. |
|---|---|---|---|---|---|---|---|---|---|---|
| *Felis p. chui.* | | | | | | | | | | |
| Uganda: Gondokoro | [1] 164764 | Male | 1240 | 840 | 255 | 90 | 16.1 | 24.0×13.5 | 17.8× 8.9 | 18.7× 9.2 |
| Lado: Rhino Camp | 164763 | do | 1180 | 755 | 260 | 76 | 17.1 | 26.2×12.8 | 18.2× 9.0 | 20.3× 9.6 |
| B. E. A.: Nzoia River | 163093 | Female | 1220 | 840 | 230 | 75 | 13.7 | 23.3×12.2 | 15.8× 7.8 | 17.7× 8.1 |
| *Felis p. suahelica.* | | | | | | | | | | |
| B. E. A.: | | | | | | | | | | |
| Ulu | 182329 | Male | | | | | 14.8 | 24.6×12.6 | 17.6× 8.4 | 17.8× 8.5 |
| Kapiti | 182323 | do | | | | | 16.1 | 24.7×12.9 | 17.0× 8.6 | 18.0× 9.3 |
| Kabalolot Hill | 181595 | do | 1250 | 910 | 240 | 80 | 16.2 | 24.7×12.5 | 17.2× 8.5 | 17.7× 9.0 |
| Kisii | 162147 | do | | | | | 16.8 | 26.2×14.2 | 17.1× 7.4 | 18.5× 8.7 |
| Meru | 163095 | do | 1270 | 830 | 250 | 83 | 17.3 | | 18.2× 9.0 | 20.4× 9.3 |
| Rumathe River | 182178 | do | 1180 | 830 | 235 | 75 | 17.2 | 25.2×13.2 | 16.8× 8.7 | 19.5× 9.1 |
| Naivasha | 162926 | do | 1270 | 890 | 265 | 85 | 17.0 | 24.8×13.3 | 17.3× 8.1 | 18.1× 9.4 |
| Do | 162927 | do | | | | | 16.8 | 26.0×13.6 | 16.8× 8.2 | 21.0×10.2 |
| Ulu | 184818 | Female | | | | | 12.3 | 21.5×11.1 | 14.5× 7.3 | 16.8× 8.2 |
| Do | 184819 | do | | | | | 11.8 | 22.3×10.5 | 14.7× 7.1 | 16.6× 7.7 |
| Juja Farm | 161911 | do | 1000 | 730 | 220 | 68 | 13.8 | 22.2×11.4 | 15.0× 7.3 | 15.7× 7.2 |
| Kisii | 162144 | do | | | | | 13.1 | 21.8×11.8 | 14.5× 7.1 | 15.9× 7.8 |
| Do | 162145 | do | | | | | 13.0 | 22.8×11.4 | 15.5× 6.6 | 15.8× 7.7 |
| Do | 162146 | do | | | | | 13.2 | 24.3×12.7 | 15.5× 8.2 | 17.2× 8.2 |
| Kampi Moto | 163094 | do | | | | | 14.0 | 22.9×12.0 | 15.0× 7.7 | 16.3× 8.6 |
| *F. fortis.* | | | | | | | | | | |
| B. E. A.: Loita Plains | [1] 181600 | Male | | | | | 18.7 | 26.8×15.4 | 19.1×11.0 | 19.2× 9.4 |

[1] Type-specimen.

Nzoia River skin listed under the latter form. The Meru specimen, which has been referred by Roosevelt and Heller to the Ruwenzori form,[1] is peculiar in color. It is a fine, large leopard, with large spots and of a dark general coloration. The skin has been mounted, which makes satisfactory comparison with tanned skins difficult; but the skull differs in no essential detail from the general type found in *suahelica*. It seems best, until more plentiful material from the region is at hand, to consider this animal a slightly peculiar individual of *suahelica*, rather than to admit the existence of a subspecies based on such a limited number of specimens with a disconnected distribution in the forested parts of Ruwenzori and Kenia. The Meru specimen, an old male, was captured in a trap. He was a "man-eater," and had only a short time before killed and eaten a native woman. His teeth were in bad condition, the upper carnassial virtually useless.

Young of several ages are represented in the series. The very young are quite reddish in color above, but this condition rapidly changes to the common buff ground color with brownish and blackish markings of the nearly grown though immature animal. The following weights of adult male leopards are recorded in the collector's field books: Ulu Station, 112 pounds; Lake Naivasha, 126 pounds; Meru, 100 pounds. The female from Juja Farm weighed under 70 pounds (54 pounds dressed).

The name *suahelica*, as here applied to the common East African leopard, barely escapes classification as a *nomen nudum*. Neither type-specimen nor definite type-locality were designated by Neumann, in describing, or rather naming, the race. "Reference to his [Neumann's] specimens now in the Berlin Museum shows none marked as the type, so that an exact idea of what he had in mind can not now be ascertained. Neumann labored under the supposition that two species occurred throughout East Africa, a large-spotted and a small-spotted form, the former of which he attempted to describe as *suahelica*. No substantial difference in the size of the spots in adults from the region can be detected. There is, however, a marked difference in spotting in the immature and the adults, the former being fine spotted, owing to the rosettes being broken up into several solid spots, which later coalesce to form the rosettes of the adult. Neumann's skins were chiefly flat specimens obtained from natives and were without skulls, so that their relative ages were unknown, and the error of associating the difference in size of spots with racial rather than age characters was doubtless made. Old males often show the larger and more completely ocellated spots" (Roosevelt and Heller, Life-Histories African Game Animals, vol. 1, page 237).

[1] Life-Hist. African Game Animals, vol. 1, p. 239. 1914.

The specimen from Kabalolot Hill is mentioned in Heller's journal of the Rainey Expedition as follows:

Found a tree in which a leopard had hung up a fresh kill of a topi. This tree was one of the prickly pear fruited trees, with many twisted trunks at its base, so that it was not difficult for the leopard to get a good foothold in climbing it. The topi was an adult one and placed about 10 feet above the ground. I set five traps at the base of the tree and caught the leopard during the night.

#### FELIS FORTIS Heller.

Plates 46, 47.

1913. *Felis pardus fortis* Heller, Smithsonian Misc. Coll., vol. 61, No. 19, p. 5. November 8. (Aggate's Ranch, Loita Plains, British East Africa; type in U. S. Nat. Mus.)

1914. *Felis pardus fortis* Roosevelt and Heller, Life-Hist. African Game Anim., vol. 1, p. 241.

*Specimen.*—One, the type, from—

British East British: Loita Plains (Rainey).

The unique type-specimen of this leopard was killed by a rancher in the Loita Plains bush country bordering his farm and was purchased from him for the United States National Museum by Paul J. Rainey May 31, 1911. In size, color, skull, and dental characters this specimen differs widely from all other leopards in the collection. A case of very exceptional individual variation is here represented or else the animal belongs to a species quite distinct from the common leopard which is found in all the surrounding country.

The absence of the small upper premolar as described in the original diagnosis is, of course, of no importance as a racial character. As a matter of fact this tooth is present on both sides, can be observed without a glass, and under slight magnification can be seen to have incompletely erupted. The second upper premolar ($pm^3$) is especially peculiar; but the loss, apparently in early life, of the last lower premolar, leaving the upper tooth virtually functionless, makes any speculation on the differences as based on this single example of no real value.

#### FELIS CAPENSIS HINDEI Wroughton.

1910. *Felis capensis hindei* Wroughton, Ann. and Mag. Nat. Hist., ser. 8, vol. 5, p. 205. February. (Machakos, British East Africa; type in British Museum.)

1910. *Felis capensis hindei* Roosevelt, African Game Trails, Amer. ed., p. 476; London ed., p. 487.

*Specimens.*—Eight, from localities as follows:

Lado: Rhino Camp, 1 skull (Mearns).

Uganda: Gondokoro, 1 (Heller).

British East Africa: Kakumega, 1 (Heller); Meru Road, Laikipia, 1 (K. Roosevelt); Mount Kenia Forest Station, 1 skull (Mearns); Naivasha, 1 skull (Loring); Suswa Plain, Sotik, 1 (Heller); Telek River, Sotik, 1 (Heller).

There is considerable variation in tone of ground color and in the pattern of markings within this small series and it is quite evident that a large number of specimens of the East African serval must be assembled before satisfactory results in the distinguishing of subspecies can be assured. The characters used by Wroughton to separate *hindei* from *Felis capensis kempi*,[1] described from Kirui, Mount Elgon, at 6,000 feet,[2] are apparently not of much use in distinguishing forms. Adult male skulls of *hindei* in our collection are as large as the dimensions given for *kempi*, and it is plain that no great difference in size between these two forms exists. I have seen no specimens from Elgon; but can not distinguish our Kakumega specimen, a young adult female, from other East African skins and skulls of *hindei* by any differences of subspecific value.

The Gondokoro skin is slightly more cinnamon colored above than are any of the British East African skins, and the spots and stripes are more broken than usual; but, bearing in mind the great variation known to exist in mammals marked as are the servals, it seems very unwise to recognize a new form based on color alone without a sufficient series of specimens to prove the constancy of the variation. The skin from Meru Road has been mounted and therefore is not comparable with tanned skins; the general appearance and size of markings is much changed by the necessary stretching from the shrunken state usual to tanned skins.

Two specimens from Beira, Portuguese East Africa, and one from Concession Hill, Mashonaland, in the collection, indicate that the form described by Wroughton from Beira, *Felis capensis beiræ*, is a recognizable subspecies. The color differences are slight but the teeth average larger and stouter. The general size of the animal is not much, if any, greater than that of *F. c. hindei*.

The stomach of the Kakumega specimen is recorded by Heller to have contained small rodents—1 *Dendromus* and 3 *Leggada*.

For the use of the specific name *capensis* Forster, 1781, in place of *serval* Erxleben, 1776, see a paper in 1910 by Wroughton.[3]

For measurements of specimens see table, page 177.

[1] Ann. and Mag. Nat. Hist., ser. 8, vol. 5, p. 206. February, 1910.

[2] "Kiru Villages are 6 miles below caves on the south slope of Elgon."—E. Heller, MSS.

[3] Ann. and Mag. Nat. Hist., ser. 8, vol. 5, p. 205, 1910.

*Measurements of servals from East Africa.*

| Locality. | No. | Sex. | Head and body. | Tail vertebræ. | Hind foot. | Skull: Condylobasal length. | Zygomatic breadth. | Mastoid breadth. | Rostral breadth over canine. | Mandible. | Front of upper canine to back of $pm^4$. | Length of upper carnassial. | Front of lower canine to back of $m_1$. | Observations. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *F. c. hindei.* | | | | | | | | | | | | | | |
| Uganda: Gondokoro | 164755 | Female | 710 | 270 | 160 | 106 | 79 | 45 | 30 | 77 | 34.0 | 13.0 | 37.8 | Basal suture closed. |
| Lado: Rhino Camp | 164842 | [Male] | | | | 111 | 82 | 47 | 32 | 81 | 36.8 | 14.7 | 40.7 | Do. |
| B. E. A.: | | | | | | | | | | | | | | |
| Kakumega | 182383 | Female | 685 | 270 | 163 | 101 | 72 | 46 | 27 | 72 | 33.1 | 12.7 | 37.5 | Basal suture open. |
| Meru Road | 163092 | do | | | | 109 | 77 | 47 | 28 | 78 | 33.7 | 12.7 | 38.5 | Basal suture closed. |
| Mount Kenia | 163292 | Male | | | | 116 | 84 | | 31 | 83 | 37.2 | 13.7 | 41.7 | Basal suture open. |
| Naivasha | 162142 | | | | | | | | 28 | | 36.7 | 14.5 | 40.3 | |
| Telek River | 181593 | Male | 780 | 335 | 175 | 115 | 83 | 50 | 31 | 83 | 38.0 | 14.3 | 42.6 | Basal suture closed. |
| Suswa Plain | 181594 | do | 860 | 330 | 190 | 115 | 84 | 51 | 32 | 83 | 37.7 | 14.4 | 42.2 | Do. |
| *F. c. beiræ.* | | | | | | | | | | | | | | |
| Portuguese E. A.: Beira | 61755 | | | | | 107 | 79 | | 29 | 79 | 35.9 | 13.5 | 40.6 | Basal suture closed. |
| Do | 61754 | Female | | | | 110 | 83 | 48 | 31 | 79 | 37.9 | 15.0 | 42.0 | Basal suture open. |
| Mashonaland: Concession Hill. | 21645 | Male | 610 | 292 | | 114 | 76 | 49 | 30 | 81 | 40.2 | 15.0 | 44.0 | Do. |

FELIS OCREATA NANDÆ Heller.

Plates 48, 49.

1913. *Felis ocreata nandæ* Heller, Smithsonian Misc. Coll., vol. 61, No. 13, p. 14. September 16. (Headwaters of the Lukosa River, Nandi Escarpment. British East Africa, 7,000 feet; type in U. S. Nat. Mus.)

*Specimens.*—Four, from localities as follows:

British East Africa: Kakumega, 3 (Heller); Lukosa River, 1 (Heller).

I have seen no specimens of *Felis ocreata ugandæ* Schwann,[1] described from Mulema, Uganda, but judging from the description this race must be very much like it. Mr. Heller has compared our material with the type and two additional specimens of *ugandæ* in the British Museum, however, and states that *nandæ* is darker in color. One adult specimen from the Kakumega lot is very much lighter than the type of *nandæ*, and only slightly darker than certain specimens of *Felis ocreata taitæ*. This conspicuous variation makes it highly desirable that larger series of these cats be brought together that the ranges of individual variation and of geographical variation may be studied intelligently.

The stomach of the type-specimen contained a specimen of *Rattus medicatus*.

FELIS OCREATA TAITÆ Heller.

Plates 50, 51.

1913. *Felis ocreata taitæ* Heller, Smithsonian Misc. Coll., vol. 61, No. 13, p. 14. September 16. (Voi, British East Africa; type in U. S. Nat. Mus.)

*Specimens.*—Four, as follows:

British East Africa: Isiola River, 1 (Heller); Juja Farm, 1 (Mearns); Ulukenia Hills, 1 (Loring); Voi, 1 (Heller).

The stomach of the Isiola River specimen contained remains of a *Tatera;* that of the Voi specimen an *Acomys*. The Juja Farm specimen was shot by Mr. McMillan and presented by him to Doctor Mearns. In color it is white, buff, and bright ochraceous-orange. The pattern is almost precisely that of a wild cat. This specimen may possibly be a mixed wild and domestic cat; but, from all the characters, it seems more probable that it is a partially albino wild cat. The tail rings are distinct and not connected above.

For measurements of cats of the *ocreata* group see table, page 179.

FELIS TORQUATA Cuvier.

1827. *Felis torquata* Temminck, Mon. Mamm., vol. 1, p. 255. (Based on Geoffroy and Cuvier, Hist. Mamm., pl. 126—"Chat du Nepaul.")

1907. *Felis torquata* Pocock, Proc. Zool. Soc. London, 1907, p. 151; pl. 9. (Name revived for the "striped" domestic cat.)

*Specimens.*—Two, as follows:

British East Africa: Changamwe, 1 skull (Mearns); Nairobi, 1 (Mearns).

[1] Ann. and Mag. Nat. Hist., ser. 7, vol. 13, p. 424. June, 1904.

*Measurements of specimens of the Felis ocreata group from British East Africa.*

| Locality. | No. | Sex. | Head and body. | Tail vertebræ. | Hind foot. | Skull: Condylobasal length. | Zygomatic breadth. | Mastoid breadth. | Mandible. | Front of upper canine to back of *pm*[4]. | Length of upper carnassial. | Front of lower canine to back of *m*[1]. | Length of lower molar. | Observations. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *F. o. nandæ.* | | | | | | | | | | | | | | |
| Lukosa River | [1] 182367 | Male | 530 | 410 | 140 | 94 | 69 | 43.4 | 67 | 32.0 | 10.5 | 36.2 | 8.8 | Basal suture open. |
| Kakumega | 182389 | do | 520 | 335 | 135 | 91 | 71 | 42.7 | 64 | 29.7 | 11.0 | 33.9 | 8.9 | Basal suture closed. |
| Do | 182390 | Female | 475 | 380 | 122 | 82 | 62 | 41.0 | 58 | 28.0 | 11.0 | 30.6 | 8.1 | Basal suture open. |
| *F. o. taitæ.* | | | | | | | | | | | | | | |
| Isiola River | 182022 | Female | 500 | 340 | 125 | 82 | 59 | 38.2 | 57 | 28.5 | 10.7 | 31.5 | 8.0 | Basal suture closed. |
| Vol | [1] 182220 | do | 495 | 310 | 118 | 80 | 63 | 40.0 | 59 | 26.7 | 10.6 | 30.8 | 8.6 | |
| Juja Farm | 162020 | Male | 525 | 290 | 135 | | | | | | | | | |
| *F. torquata.* | | | | | | | | | | | | | | |
| Nairobi | 162143 | Male | 550 | 270 | 125 | | | | 63 | 28.8 | 11.0 | 33.0 | 8.3 | |

[1] Type.

The specimen from Nairobi was shot by Doctor Mearns in the woods near town. Its markings are almost exactly those of wild cats, except that the black areas are more sharply drawn and the tail has the dark rings connected along the upper side by a continuous stripe. The ground color is clear gray, without brown tones. This specimen may possibly be a mixture of wild stock and domestic stock, but the pattern and color are almost exactly those of feral domestic cats in various tropical countries, and the skull and teeth show the slight peculiarities of the domestic cat as opposed to the wild. In Doctor Lönnberg's account of the mammals collected by the Swedish Zoological Expedition to British East Africa in 1911,[1] he says: "Mrs. McMillan told me that the wild cats interbred with the domesticated cats at Juja Farm."

Among the feral domestic cats in the museum collection is a skin from Cuba which is almost indistinguishable from certain skins of African wild cats, especially the type skin of *Felis ocreata nandæ*

[1] Kungl. Svenska Vet. Akad. Handl., vol. 48, No. 5, p. 82. 1912.

Heller, except that in the Cuban specimen the blackish tail rings are connected along the upper side.

### Genus LYNX Kerr.

1792. *Lynx* Kerr, Anim. Kingd., Syst. Cat., No. 288, p. 155. (*L. lynx.*)
1843. *Caracal* Gray, List Spec. Mamm. Brit. Mus., p. 46. (*L. caracal.*)
1858. *Urolynchus* Severtzow, Rev. Mag. Zool., Paris, ser. 2, vol. 10, p. 389. September. (*L. caracal.*)

The United States National Museum collection contains no specimens of the caracal in addition to those listed below, except of the Arabian and Cape of Good Hope forms. Actual comparison with specimens of true *nubicus* is therefore impossible, but authors generally have of late referred the East African caracal to the *nubicus* of Fitzinger, which is long antedated by *Felis caracal nubicus* Fischer.

#### LYNX CARACAL NUBICUS (Fischer).

1829. *F[elis] caracal* γ *nubicus* Fischer, Synopsis Mamm., p. 210. (Nubia.)

*Specimens.*—Four, as follows:

British East Africa: Nairobi, 1 (Klein); Ulu Station, 3 (Rainey.)

Two adult specimens from Ulu Station, each with the basal suture of the skull obliterated, measure as follows:

| | 182310 ♂ | 182317 ♀ |
|---|---|---|
| | *mm.* | *mm.* |
| Head and body | 800 | 795 |
| Tail vertebræ | 300 | 250 |
| Hind foot | 190 | 177 |
| Ear | 80 | 75 |
| Skull: | | |
| Condylobasal length | 120 | 111 |
| Zygomatic breadth | 87 | 84 |
| Mastoid breadth | 55 | 52 |
| Interorbital breadth | 24 | 23 |
| Breadth of rostrum over canine | 31 | 29 |
| Length of mandible | 88 | 80 |
| Front of upper canine to back of $pm^4$ | 40.4 | 36.4 |
| Length of upper carnassial | 16.0 | 15.2 |
| Front of lower canine to back of $m_1$ | 44.8 | 40.1 |
| Length of lower molar | 12.1 | 11.2 |

## EXPLANATION OF PLATES.

The smaller skulls were photographed one and one-half times natural size and reduced one-third in the half-tone, while the medium-sized specimens were taken natural size. The scale as given is in most cases correct, but allowance should be made for very slight variations from the size of the actual specimens which sometimes exist in plates made by the photographic process.

### Plate 1.

Map of Eastern Equatorial Africa.

### Plate 2.

Mounted hyenas in the U. S. National Museum:

Upper figure. Highland Striped Hyena (*Hyæna hyæna schillingsi*). Adult female; Cat. No. 163110; Olarakeri, Sotik, British East Africa, July 1, 1909. Edmund Heller.

Lower figure. Eastern Spotted Hyena (*Crocuta crocuta germinans*). Adult female; Cat. No. 163106; southwest side of Mount Kenia, British East Africa, October 12, 1909. J. A. Loring.

### Plate 3.

Palatal views of skulls of *Hyæna* (two-thirds natural size):

Upper figure. *Hyæna hyæna bergeri.* Adult female; Cat. No. 182040; Lakiundu River, British East Africa, July 12, 1911. E. Heller.

Lower figure. *Hyæna dubia.* Adult female; Cat. No. 172923; "Habesch," Eritrea. G. Schrader.

### Plate 4.

Group of mounted East African Lions in U. S. National Museum:

*Felis leo massaica.* Adult male, 2 adult females, and 2 young. Collected by Col. Theodore Roosevelt. Group designed and built by George B. Turner.

### Plate 5.

Mounted East African Leopard and Cheetah in U. S. National Museum:

Upper figure. East African Leopard (*Felis pardus suahelica*). Adult male; Cat. No. 163095; Meru, British East Africa, September 7, 1909. E. Heller.

Lower figure. Rainey's Cheetah (*Acinonyx jubatus raineyi*). Adult male; Cat. No. 161922; Wami Hill, Kapiti Plains, British East Africa, May 2, 1909. Kermit Roosevelt.

### Plate 6.

*Skulls of type-specimens (natural size).*

Figs. 1, 2. *Erinaceus sotikæ* Heller. Adult male; Cat. No. 162112. (=*Erinaceus albiventris hindei.*)

3. *Elephantulus rufescens mariakanæ* Heller. Adult female; Cat. No. 181821.

4, 5. *Elephantulus phæus* Heller. Adult male; Cat. No. 162074. (=*Elephantulus rufescens phæus.*)

6, 7. *Petrodomus sultani sangi* Heller. Adult male; Cat. No. 181822. (=*Cercoctenus sultan sangi.*)

## Plate 7.

*Skulls of type-specimens (natural size).*

Figs. 1, 2. *Surdisorex polulus* Hollister. Adult male; Cat. No. 163992.
3, 4. *Crocidura daphnia* Hollister. Adult female; Cat. No. 164898.
5, 6. *Sylvisorex gemmeus* Heller. Adult male; Cat. No. 164644.
7, 8. *Pachyura lixa aequatoria* Heller. Adult male; Cat. No. 181814.
9, 10. *Crocidura lutrella* Heller. Adult male; Cat. No. 164640.
11, 12. *Crocidura sururæ* Heller. Adult male; Cat. No. 164637.
13, 14. *Crocidura simiolus* Hollister. Adult female; Cat. No. 197959.
15, 16. *Crocidura suahelæ* Heller. Adult male; Cat. No. 181815.
17, 18. *Crocidura parvipes nisa* Hollister. Adult female; Cat. No. 182440.

## Plate 8.

*Skulls of type-specimens (natural size).*

Figs. 1, 2. *Crocidura mutesæ* Heller. Adult female; Cat. No. 164636.
3, 4. *Crocidura nilotica* Heller. Adult female; Cat. No. 164638. (=*Crocidura turba nilotica.*)
5, 6. *Crocidura turba lakiundæ* Heller. Adult female; Cat. No. 181816. (=*Crocidura turba zaodon.*)
7, 8. *Crocidura alchemillæ* Heller. Adult male; Cat. No. 163087. (=*Crocidura fumosa fumosa.*)
9, 10. *Crocidura raineyi* Heller. Adult male; Cat. No. 181817.
11, 12. *Crocidura maanjæ* Heller. Adult male; Cat. No. 164639. (=*Crocidura hildegardeæ hildegardeæ.*)
13, 14. *Crocidura lutreola* Heller. Adult female; Cat. No. 181818. (=*Crocidura hildegardeæ hildegardeæ.*)
15, 16. *Crocidura hildegardeæ procera* Heller. Adult female; Cat. No. 181820. (=*Crocidura hildegardeæ hildegardeæ.*)

## Plate 9.

Skull of type-specimen of *Heliosorex roosevelti* Heller. Adult female; Cat. No. 164643. (From Smithsonian Misc. Coll., vol. 56, No. 15, pl. 1. December 23, 1910.) Twice natural size. (=*Crocidura roosevelti.*)

## Plate 10.

*Skulls of type-specimens (natural size).*

Figs. 1, 2. *Crocidura hildegardeæ altæ* Heller. Adult male; Cat. No. 181819.
3, 4. *Crocidura planiceps* Heller. Adult male; Cat. No. 164641. (=*Crocidura bicolor planiceps.*)
5, 6. *Crocidura alpina* Heller. Adult female; Cat. No. 163089. (=*Crocidura allex alpina.*)
7, 8. *Crocidura littoralis* Heller. Adult male; Cat. No. 164642.
9, 10. *Lavia rex* Miller. Adult male; Cat. No. 38197. (=*Lavia frons rex.*)
11, 12. *Rhinolophus keniensis* Hollister. Adult male; Cat. No. 166352.
13, 14. *Pipistrellus helios* Heller. Adult male; Cat. No. 181813.
15, 16. *Pipistrellus aero* Heller. Adult male; Cat. No. 181812.
17, 18. *Eptesicus ugandæ* Hollister. Adult female; Cat. No. 166520.
19, 20. *Miniopterus natalensis arenarius* Heller. Adult female; Cat. No. 181811.

PLATE 11.

*Skulls of type-specimens (natural size).*

Figs. 1, 2. *Chærephon pumilus naivashæ* Hollister. Adult male; Cat. No. 166658.
3, 4, 5. *Ictonyx capensis albescens* Heller. Adult male; Cat. No. 182724. (=*Ictonyx striatus albescens.*)

PLATES 12–13.

Skull of type-specimen of *Thos adustus bweha* Heller. Adult male; Cat. No. 182342. Natural size.

PLATES 14–15.

Skull of type-specimen of *Thos adustus notatus* Heller. Adult male; Cat. No. 181486. Natural size.

PLATES 16–17.

Skull of type-specimen of *Thos aureus bea* Heller. Adult female; Cat. No. 162904. Natural size.

PLATES 18–19.

Skull of type-specimen of *Thos mesomelas elgonæ* Heller. Adult male; Cat. No. 164699. Natural size.

PLATES 20–21.

Skull of type-specimen of *Thos mesomelas mcmillani* Heller. Adult female; Cat. No. 181483. Natural size.

PLATES 22–24.

Skull of type-specimen of *Otocyon virgatus* Miller. Adult male; Cat. No. 162126. (From Smithsonian Misc. Coll., vol. 52, plates 60, 61, and 62. December 18, 1909.) Natural size.

PLATE 25.

Skull of type-specimen of *Mellivora abyssinica* Hollister. Adult female; Cat. No. 171876. Natural size.

PLATES 26–27.

Skull of type-specimen of *Mellivora sagulata* Hollister. Adult male; Cat. No. 171875. Natural size.

PLATES 28–29.

Skull of type-specimen of *Aonyx capensis helios* Heller. Adult female; Cat. No. 175750. Natural size.

PLATE 30.

Skull of type-specimen of *Genetta pumila* Hollister. Adult male; Cat. No. 182704. Natural size.

PLATE 31.

Skull of type-specimen of *Nandinia binotata arborea* Heller. Adult male; Cat. No. 182374. Natural size.

PLATE 32.

*Skulls of type-specimens (natural size).*

Figs. 1, 2, 3. *Mungos dentifer* Heller. Adult female; Cat. No. 182732.
4, 5, 6. *Mungos sanguineus parvipes* Hollister. Adult male; Cat. No. 182739.

PLATE 33.

Skull of type-specimen of *Mungos sanguineus orestes* Heller. Adult male; Cat. No. 164152. Natural size.

PLATE 34.

*Skulls of type-specimens (natural size).*

Upper figures. *Bdeogale crassicauda omnivora* Heller. Adult female; Cat. No. 182275.
Lower figures. *Mungos paludinosus rubescens* Hollister. Adult male; Cat. No. 35251. (=*Atilax paludinosus rubescens.*)

PLATE 35.

Skull of type-specimen of *Mungos albicaudus ferox* Heller. Adult female; Cat. No. 163294. Natural size. (=*Ichneumia albicauda ibeana.*)

PLATE 36.

*Skulls of type-specimens (natural size).*

Figs. 1, 2, 3, 4. *Helogale undulata affinis* Hollister. Adult male; Cat. No. 182715.
5, 6. *Mungos albicaudus dialeucos* Hollister. Adult male; Cat. No. 184794. (=*Ichneumia albicauda dialeucos.*)

PLATE 37.

*Skulls of type-specimens (natural size).*

Figs. 1, 2. *Crossarchus fasciatus colonus* Heller. Adult female; Cat. No. 162132. Dorsal and lateral views.
3. *Proteles cristatus termes* Heller. Adult female; Cat. No. 181523. Dorsal view.

PLATE 38.

*Skulls of type-specimens (natural size).*

Figs. 1, 2. *Crossarchus fasciatus colonus* Heller. Adult female; Cat. No. 162132. Palatal view and mandible.
3. *Proteles cristatus termes* Heller. Adult female; Cat. No. 181523. Palatal view.

PLATES 39–40.

Skull of type-specimen of *Crocuta crocuta fisi* Heller. Adult male; Cat. No. 182078. One-half natural size.

PLATE 41.

Skull of type-specimen of *Acinonyx jubatus raineyi* Heller. Adult male; Cat. No. 182321. One-half natural size.

PLATE 42.

Skull of type-specimen of *Acinonyx jubatus velox* Heller. Adult male; Cat. No. 163096. One-half natural size.

PLATE 43.

Skull of type-specimen of *Felis leo roosevelti* Heller. Adult male; Cat. No. 144054 One-third natural size.

PLATES 44–45.

Skull of type-specimen of *Felis pardus chui* Heller. Adult male; Cat. No. 164764. One-half natural size.

PLATES 46–47.

Skull of type-specimen of *Felis pardus fortis* Heller. Adult male; Cat. No. 181600. One-half natural size. (=*Felis fortis*.)

PLATES 48–49.

Skull of type-specimen of *Felis ocreata nandæ* Heller. Adult male; Cat. No. 182367. Natural size.

PLATES 50–51.

Skull of type-specimen of *Felis ocreata taitæ* Heller. Adult female; Cat. No. 182220. Natural size.

PLATE 52.

Skull of wild-killed adult male *Felis leo massaica*. U.S.N.M., Cat. No. 155443; near Nairobi, British East Africa, 1908; collected by John Jay White. One-third natural size.

PLATE 53.

Skull of park-reared adult male *Felis leo massaica*. U.S.N.M., Cat. No. 199707; captured as small cub near Nairobi, British East Africa; died in Nat. Zool. Park, Washington. One-third natural size.

PLATE 54.

Skulls of adult female *Felis leo massaica* (one-third natural size).

Upper. Park-reared; U.S.N.M., Cat. No. 199524; captured as small cub near Nairobi, British East Africa; died in Nat. Zool. Park, Washington.

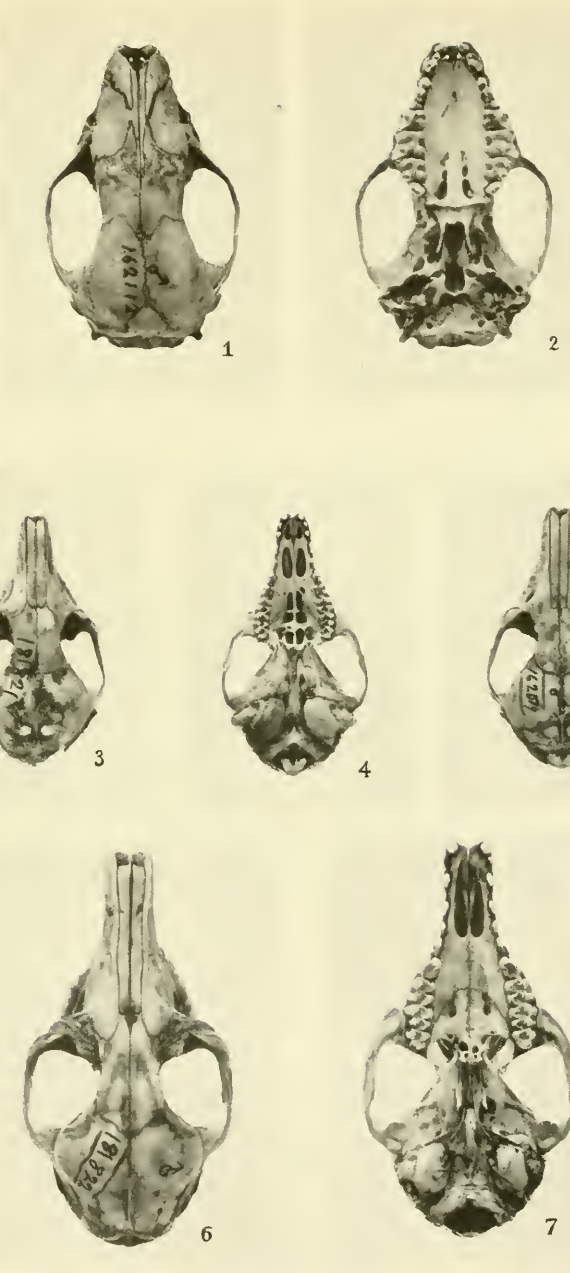
Lower. Wild-killed; U.S.N.M., Cat. No. 182326; Kapiti Station, British East Africa, 1911; collected by Paul J. Rainey.

PLATE 55.

Skulls of adult male *Felis leo massaica*, occipital views (reduced; same scale).

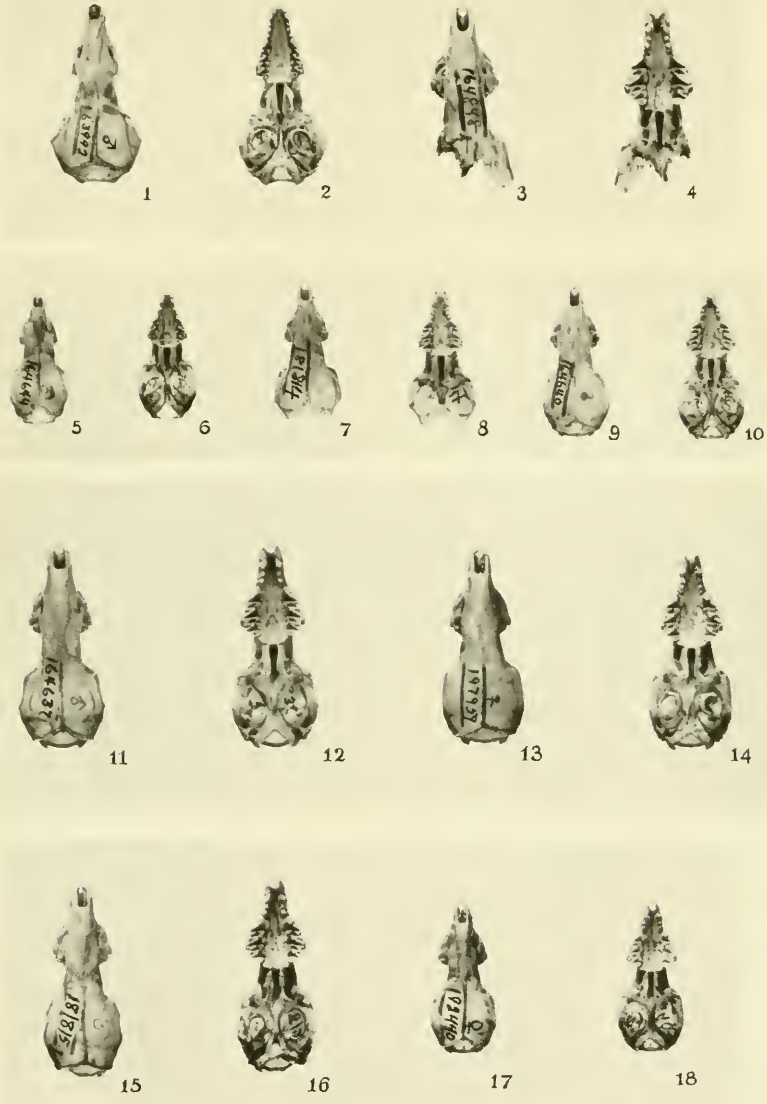
Upper. Wild-killed; U. S.N.M., Cat. No. 155443; near Nairobi, British East Africa; collected by John Jay White.

Lower. Park-reared; U.S.N.M., Cat. No. 199707; captured as small cub near Nairobi, British East Africa; died in Nat. Zool. Park, Washington.



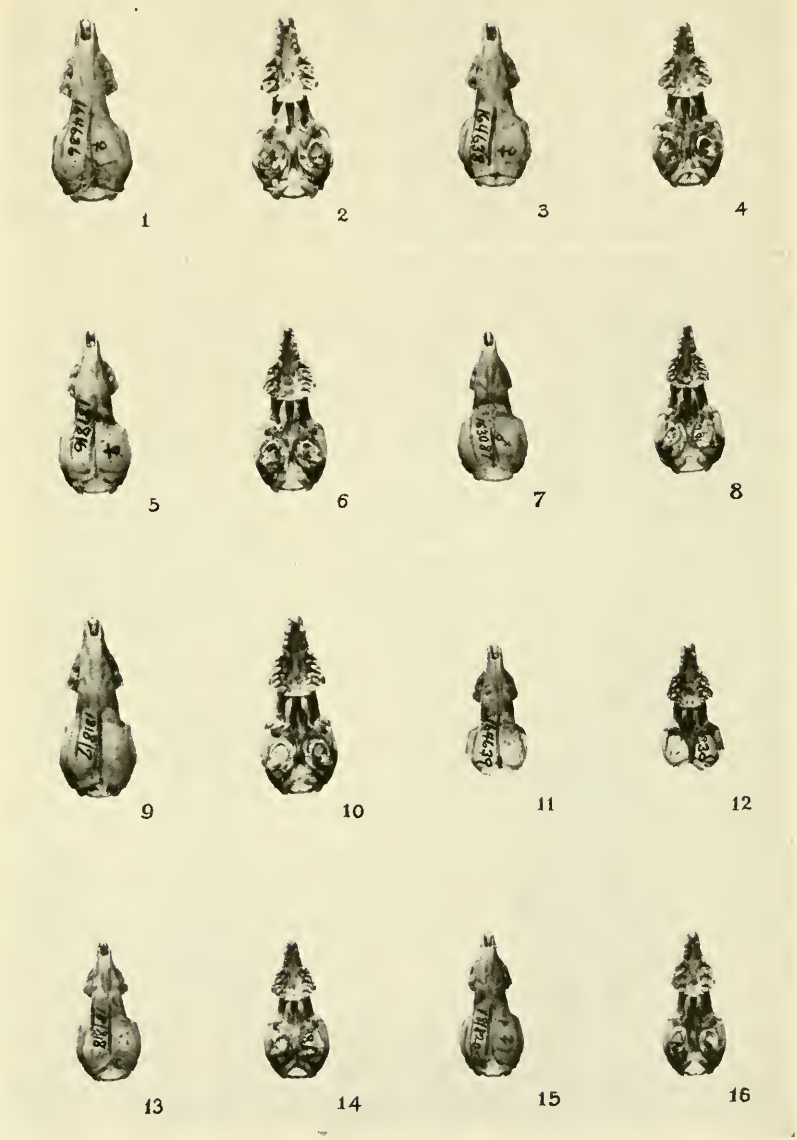

SKULLS OF TYPE-SPECIMENS OF EAST AFRICAN INSECTIVORES.
NATURAL SIZE.

FOR EXPLANATION OF PLATE SEE PAGE 181.




SKULLS OF TYPE-SPECIMENS OF EAST AFRICAN SORICIDAE.
NATURAL SIZE.

FOR EXPLANATION OF PLATE SEE PAGE 182.

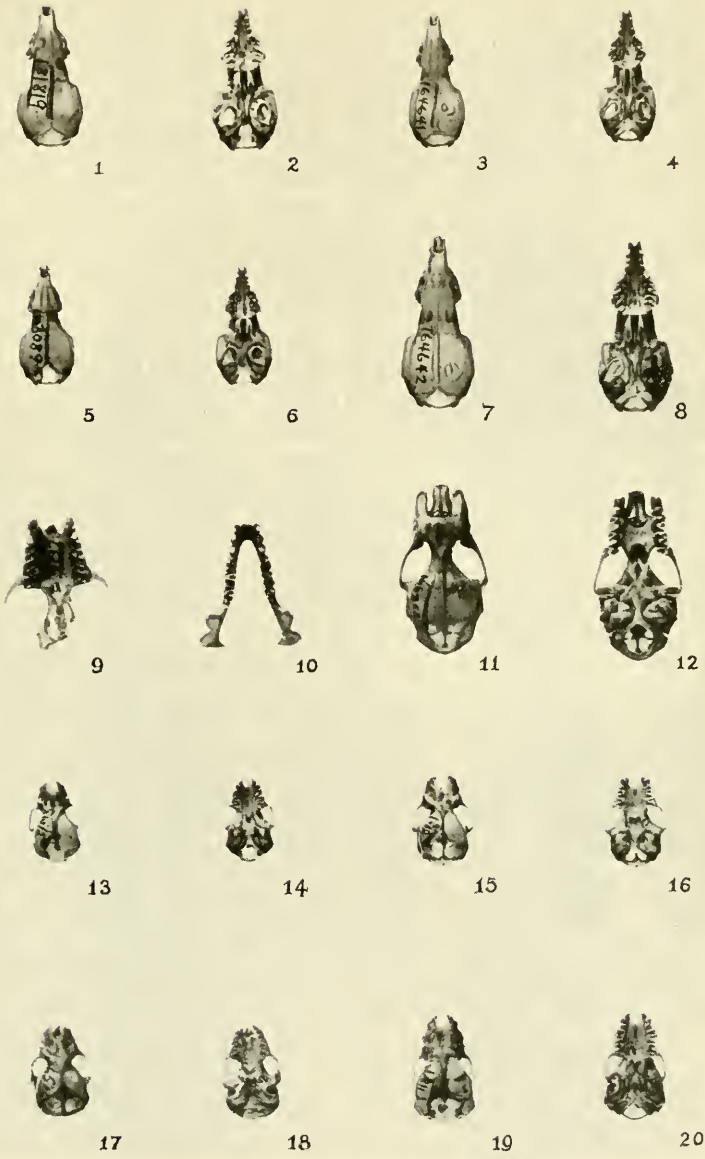



SKULLS OF TYPE-SPECIMENS OF EAST AFRICAN SPECIES OF CROCIDURA. NATURAL SIZE.

FOR EXPLANATION OF PLATE SEE PAGE 182.

HELIOSOREX (=CROCIDURA) ROOSEVELTI HELLER. TYPE, TWICE NATURAL SIZE.

FOR EXPLANATION OF PLATE SEE PAGE 182.




SKULLS OF TYPE-SPECIMENS OF EAST AFRICAN SHREWS AND BATS. NATURAL SIZE.

FOR EXPLANATION OF PLATE SEE PAGE 182.

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FIGS. 1–2, CHAEREPHON PUMILUS NAIVASHAE HOLLISTER; 3–5, ICTONYX STRIATUS ALBESCENS HELLER. TYPES, NATURAL SIZE.

FOR EXPLANATION OF PLATE SEE PAGE 183.

THOS ADUSTUS BWEHA HELLER. TYPE, NATURAL SIZE.

FOR EXPLANATION OF PLATE SEE PAGE 183.

THOS ADUSTUS BWEHA HELLER. TYPE, NATURAL SIZE.

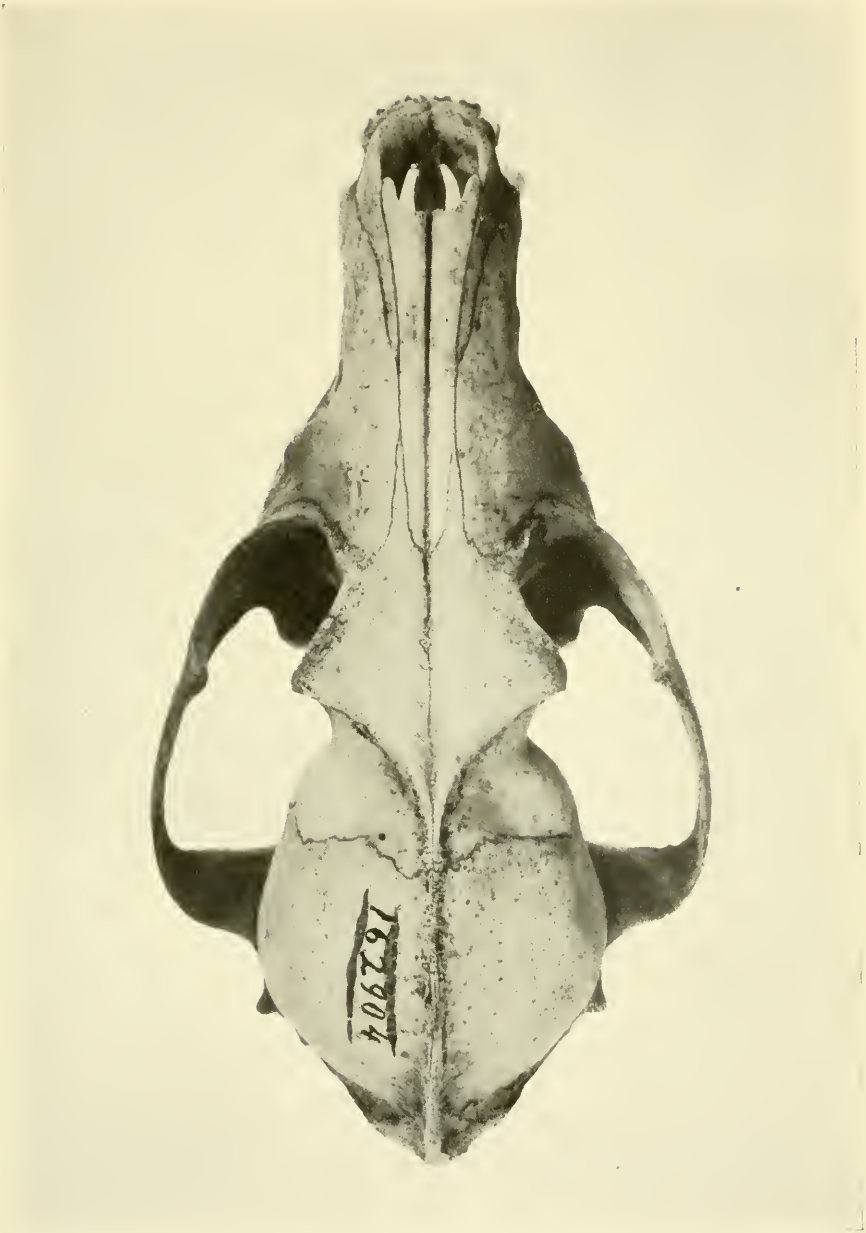
FOR EXPLANATION OF PLATE SEE PAGE 183.

THOS ADUSTUS NOTATUS HELLER. TYPE, NATURAL SIZE.

FOR EXPLANATION OF PLATE SEE PAGE 183.

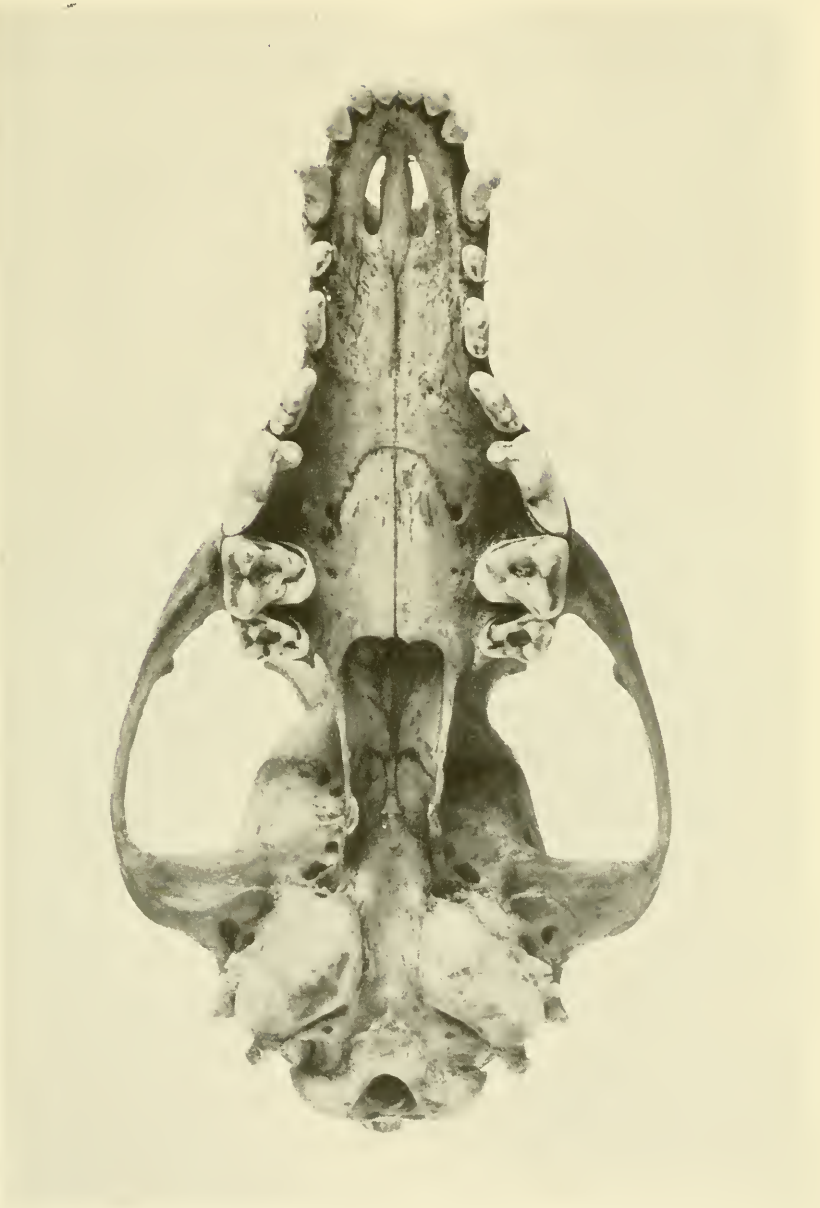
THOS ADUSTUS NOTATUS HELLER. TYPE, NATURAL SIZE.

FOR EXPLANATION OF PLATE SEE PAGE 183.



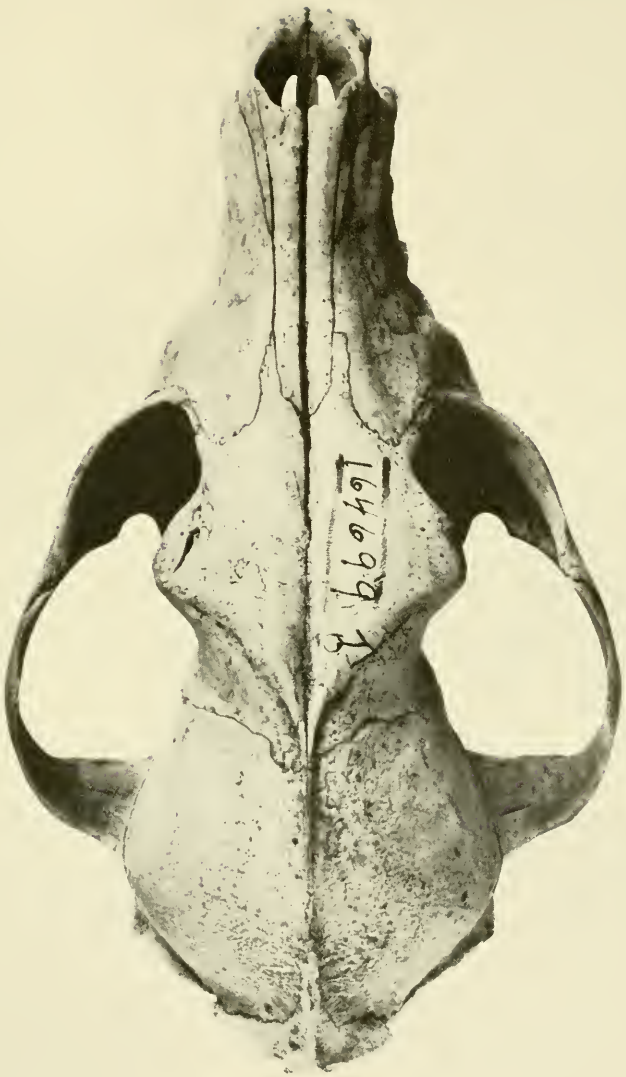

THOS AUREUS BEA HELLER. TYPE, NATURAL SIZE.

FOR EXPLANATION OF PLATE SEE PAGE 183.



THOS AUREUS BEA HELLER. TYPE, NATURAL SIZE.

FOR EXPLANATION OF PLATE SEE PAGE 183.




THOS MESOMELAS ELGONAE HELLER. TYPE, NATURAL SIZE.

FOR EXPLANATION OF PLATE SEE PAGE 183.

THOS MESOMELAS ELGONAE HELLER. TYPE, NATURAL SIZE.

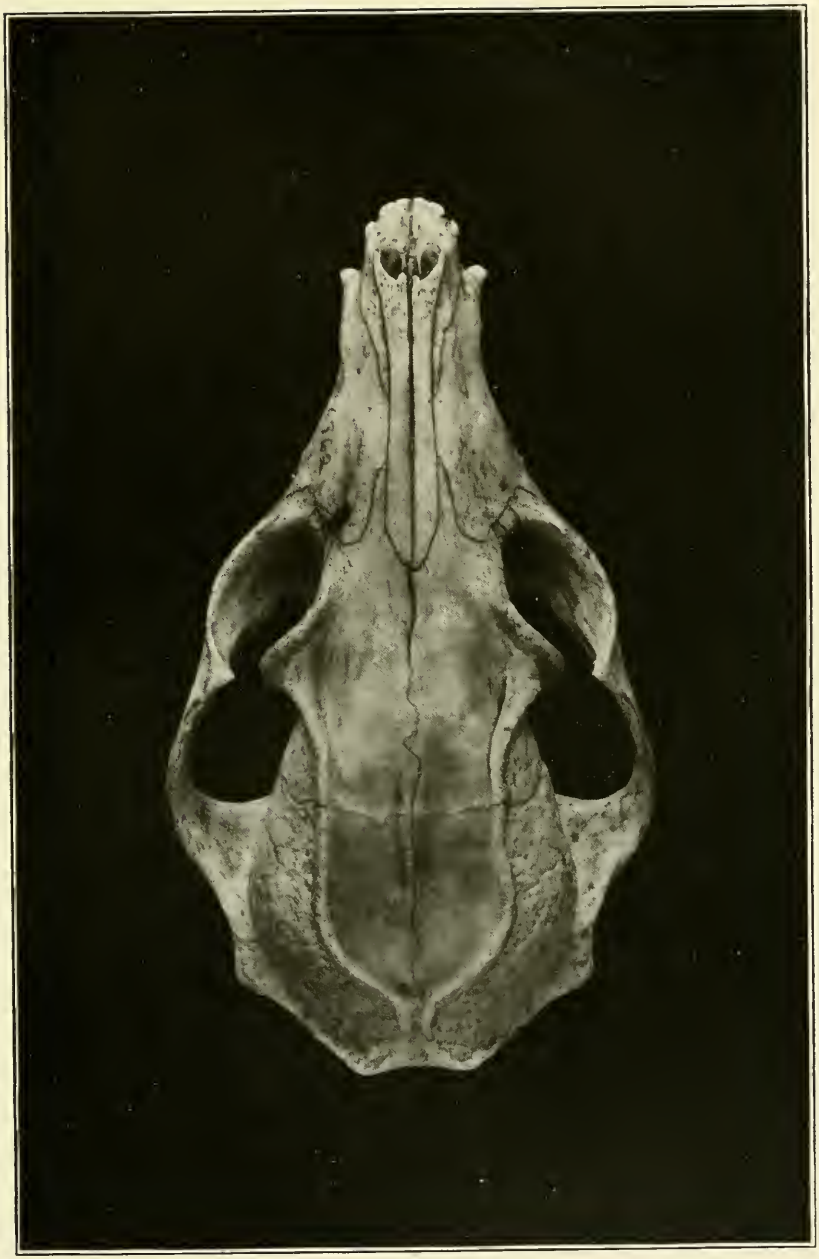
FOR EXPLANATION OF PLATE SEE PAGE 183.

THOS MESOMELAS MCMILLANI HELLER. TYPE, NATURAL SIZE.

FOR EXPLANATION OF PLATE SEE PAGE 183.

THOS MESOMELAS MCMILLANI HELLER. TYPE, NATURAL SIZE.

FOR EXPLANATION OF PLATE SEE PAGE 183.

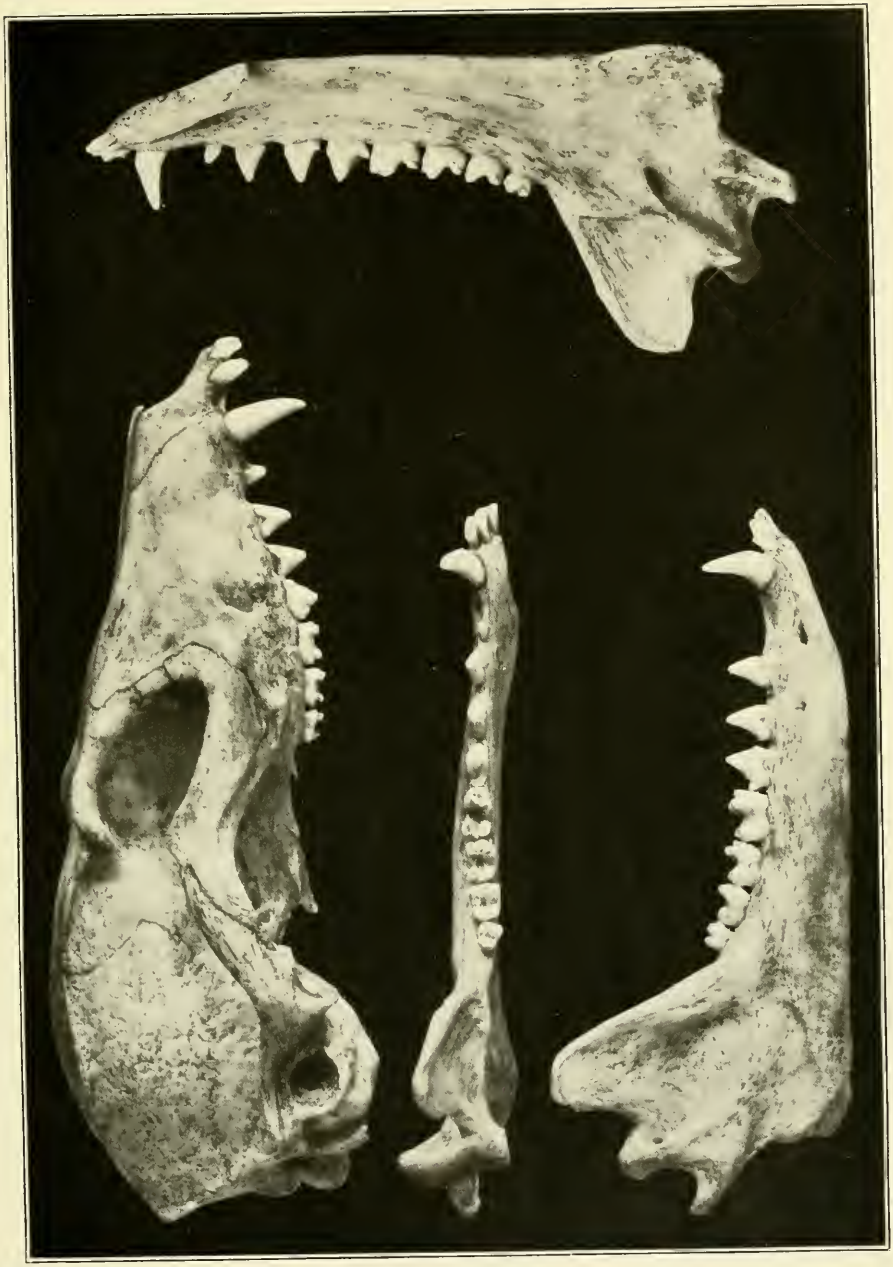


OTOCYON VIRGATUS MILLER. TYPE, NATURAL SIZE.

FOR EXPLANATION OF PLATE SEE PAGE 183.

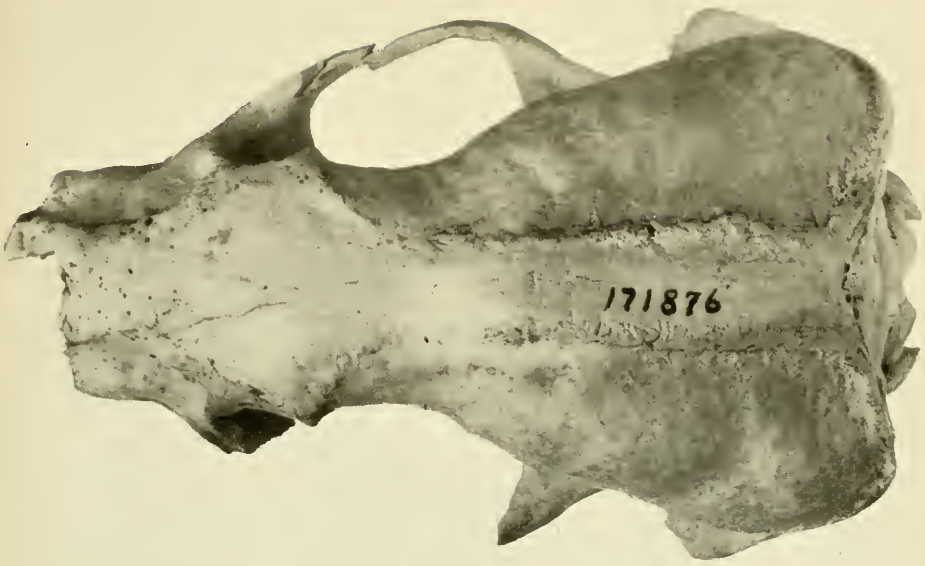
OTOCYON VIRGATUS MILLER. TYPE, NATURAL SIZE.

FOR EXPLANATION OF PLATE SEE PAGE 183.



OTOCYON VIRGATUS MILLER. TYPE, NATURAL SIZE.

FOR EXPLANATION OF PLATE SEE PAGE 183.



MELLIVORA ABYSSINICA HOLLISTER. TYPE, NATURAL SIZE.

FOR EXPLANATION OF PLATE SEE PAGE 183.

MELLIVORA SAGULATA HOLLISTER. TYPE, NATURAL SIZE.

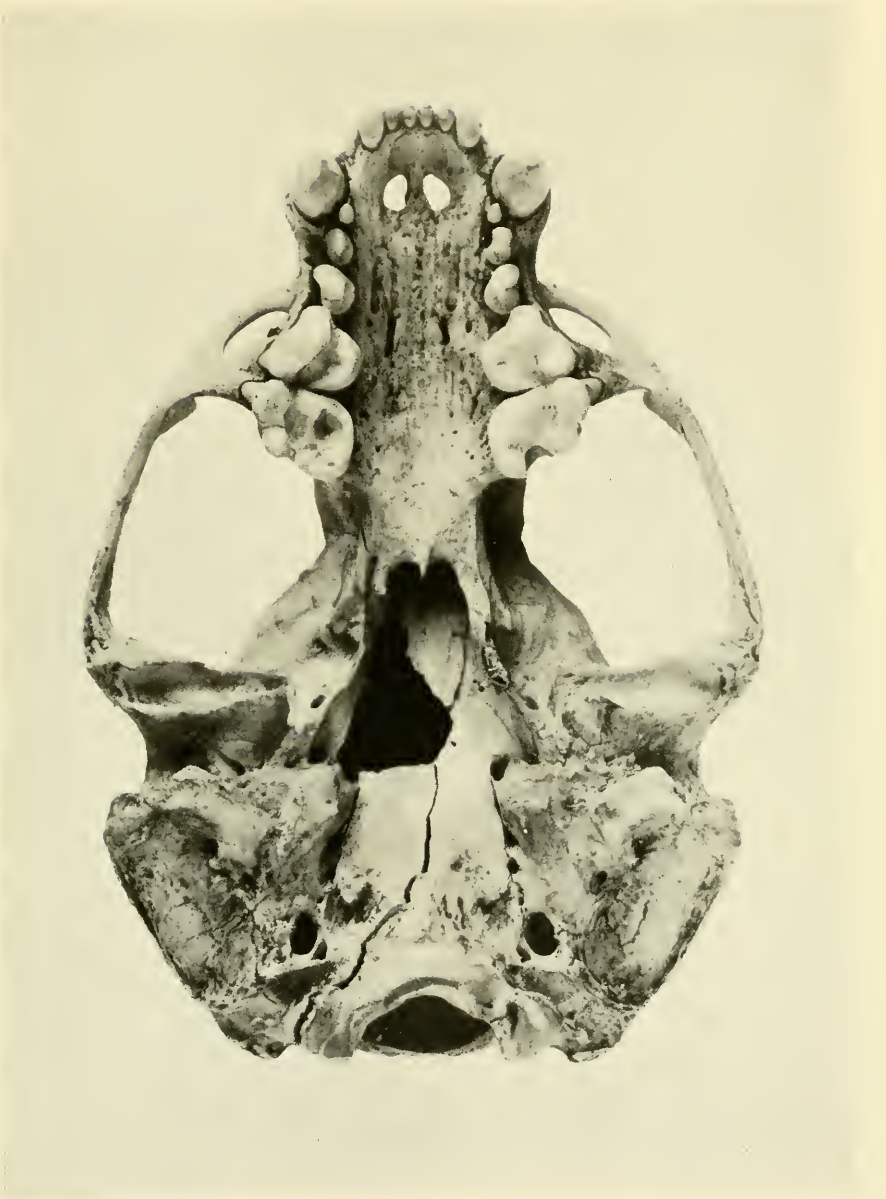
FOR EXPLANATION OF PLATE SEE PAGE 183.

MELLIVORA SAGULATA HOLLISTER. TYPE, NATURAL SIZE.

FOR EXPLANATION OF PLATE SEE PAGE 183.

AONYX CAPENSIS HELIOS HELLER. TYPE, NATURAL SIZE.

FOR EXPLANATION OF PLATE SEE PAGE 183.

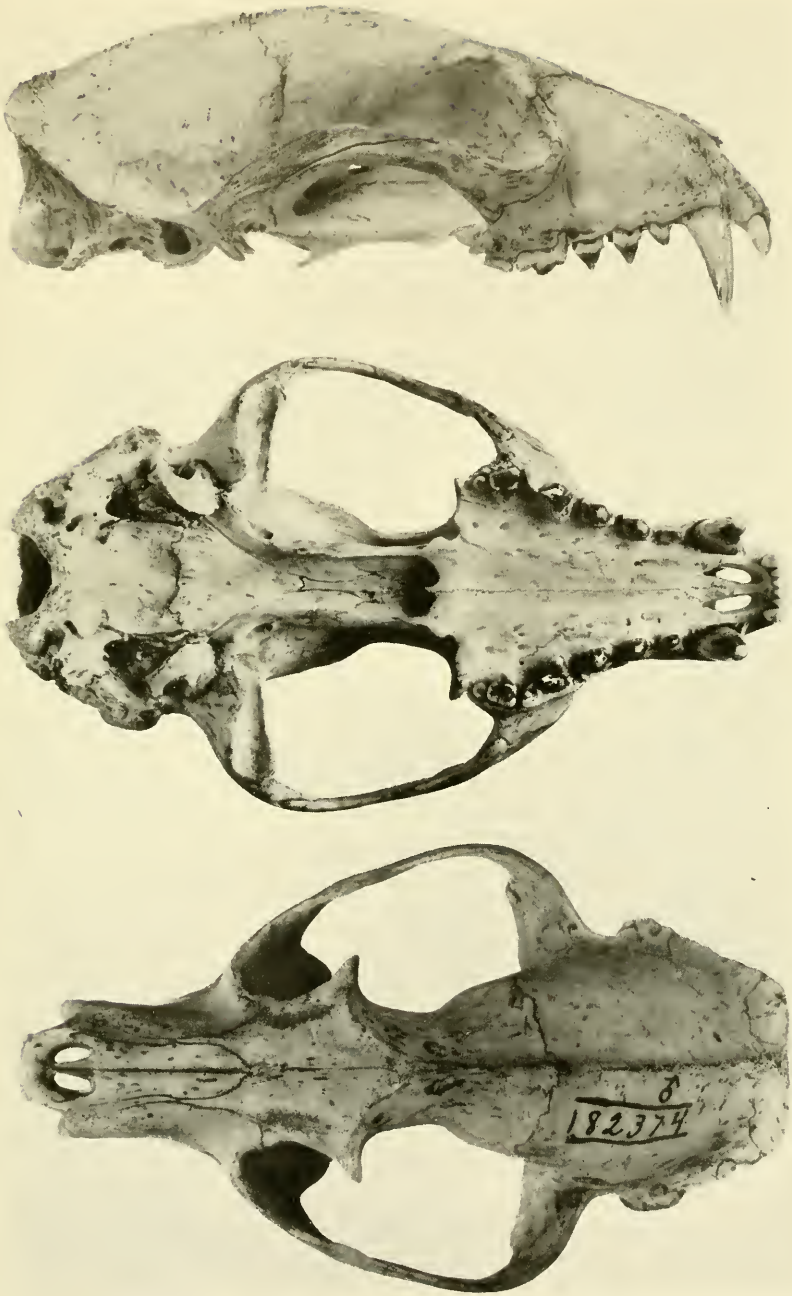


AONYX CAPENSIS HELIOS HELLER. TYPE, NATURAL SIZE.

FOR EXPLANATION OF PLATE SEE PAGE 183.

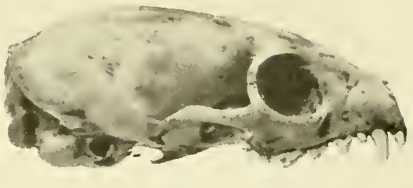
GENETTA PUMILA HOLLISTER. TYPE, NATURAL SIZE.

FOR EXPLANATION OF PLATE SEE PAGE 183.




NANDINIA BINOTATA ARBOREA HELLER. TYPE, NATURAL SIZE.

FOR EXPLANATION OF PLATE SEE PAGE 183.



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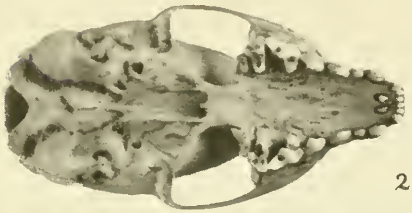

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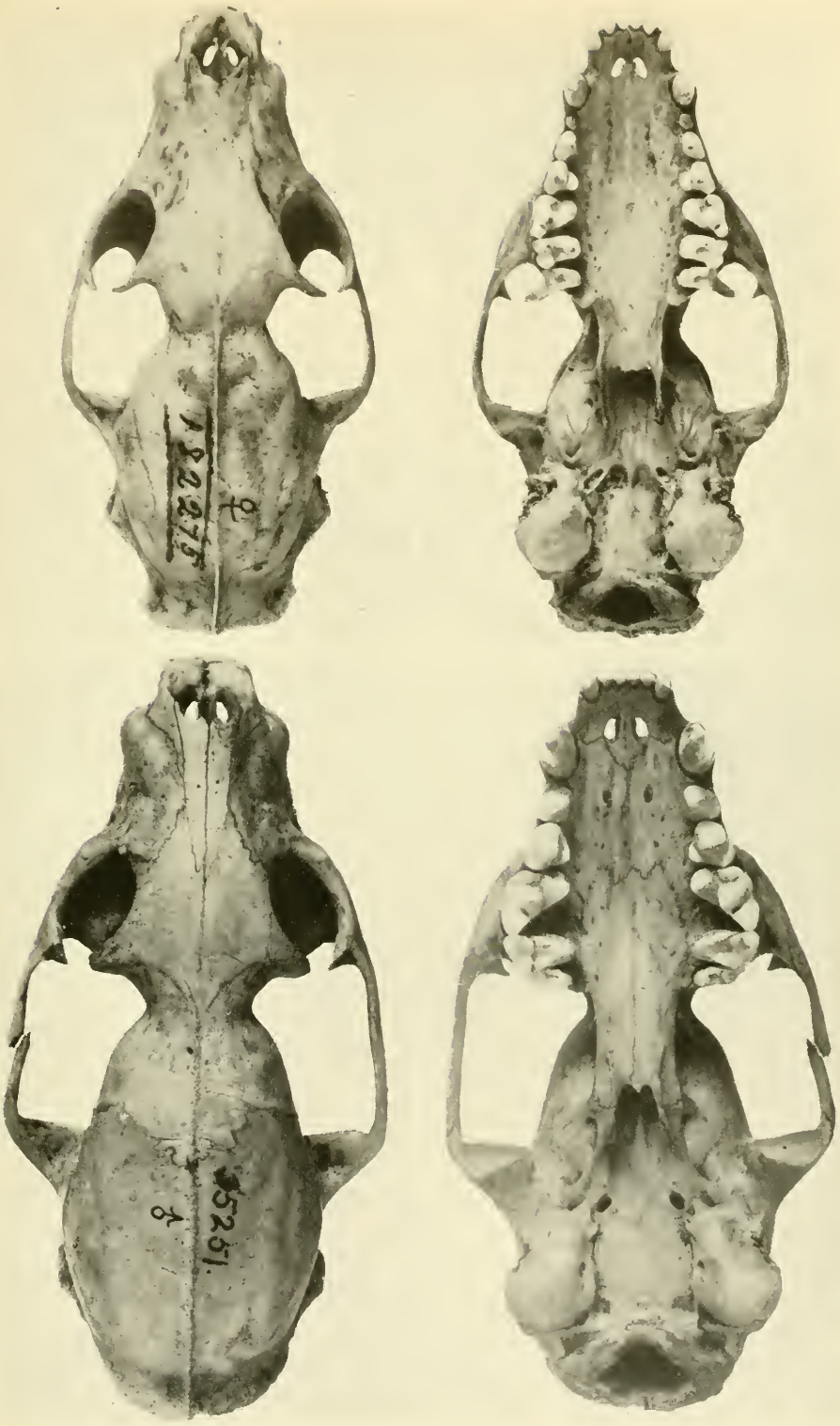
FIGS. 1–3, MUNGOS DENTIFER HELLER; 4–6, M. SANGUINEUS PARVIPES HOLLISTER. TYPES, NATURAL SIZE.

FOR EXPLANATION OF PLATE SEE PAGE 183.

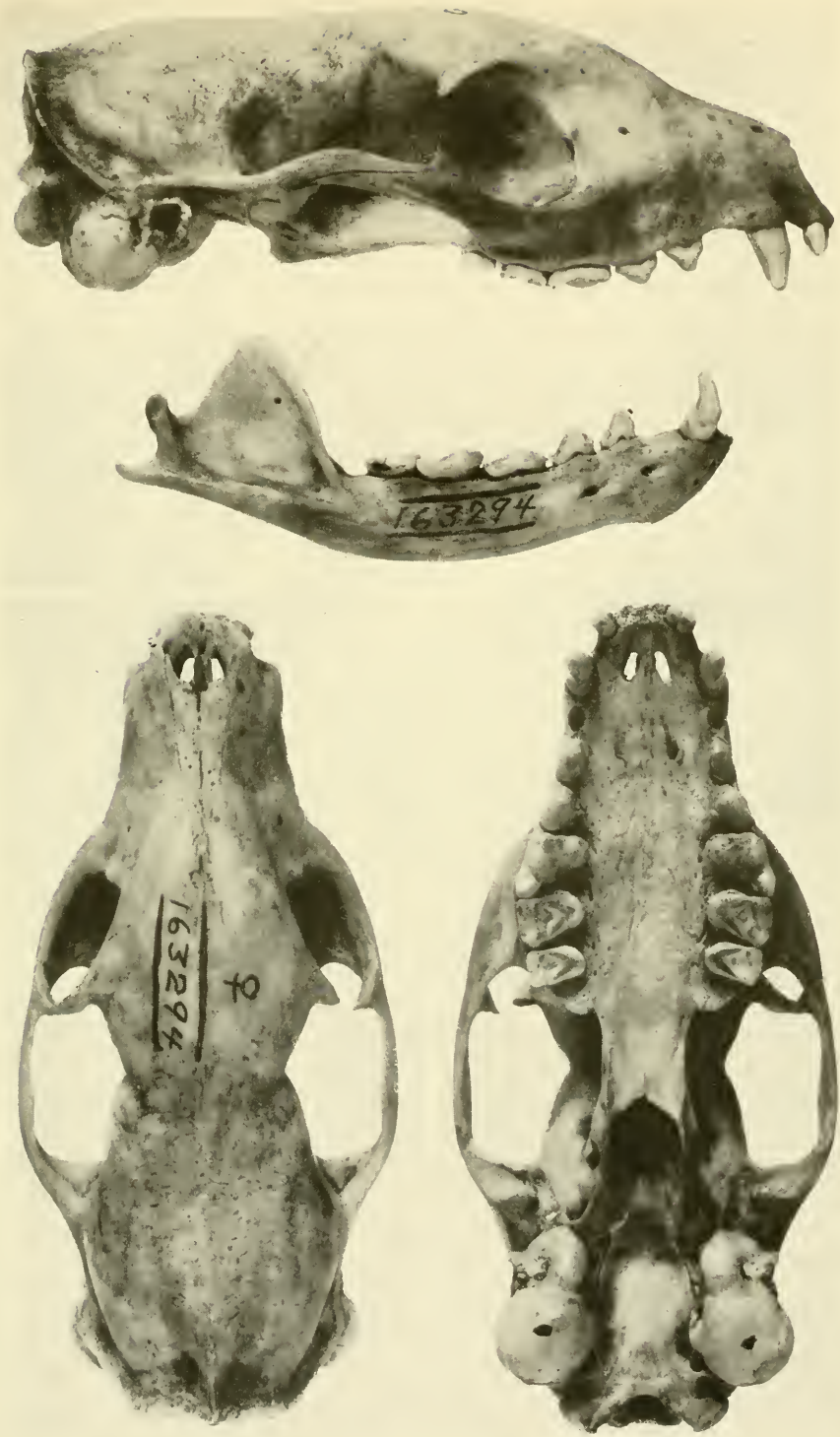
MUNGOS SANGUINEUS ORESTES HELLER. TYPE, NATURAL SIZE.

FOR EXPLANATION OF PLATE SEE PAGE 184.



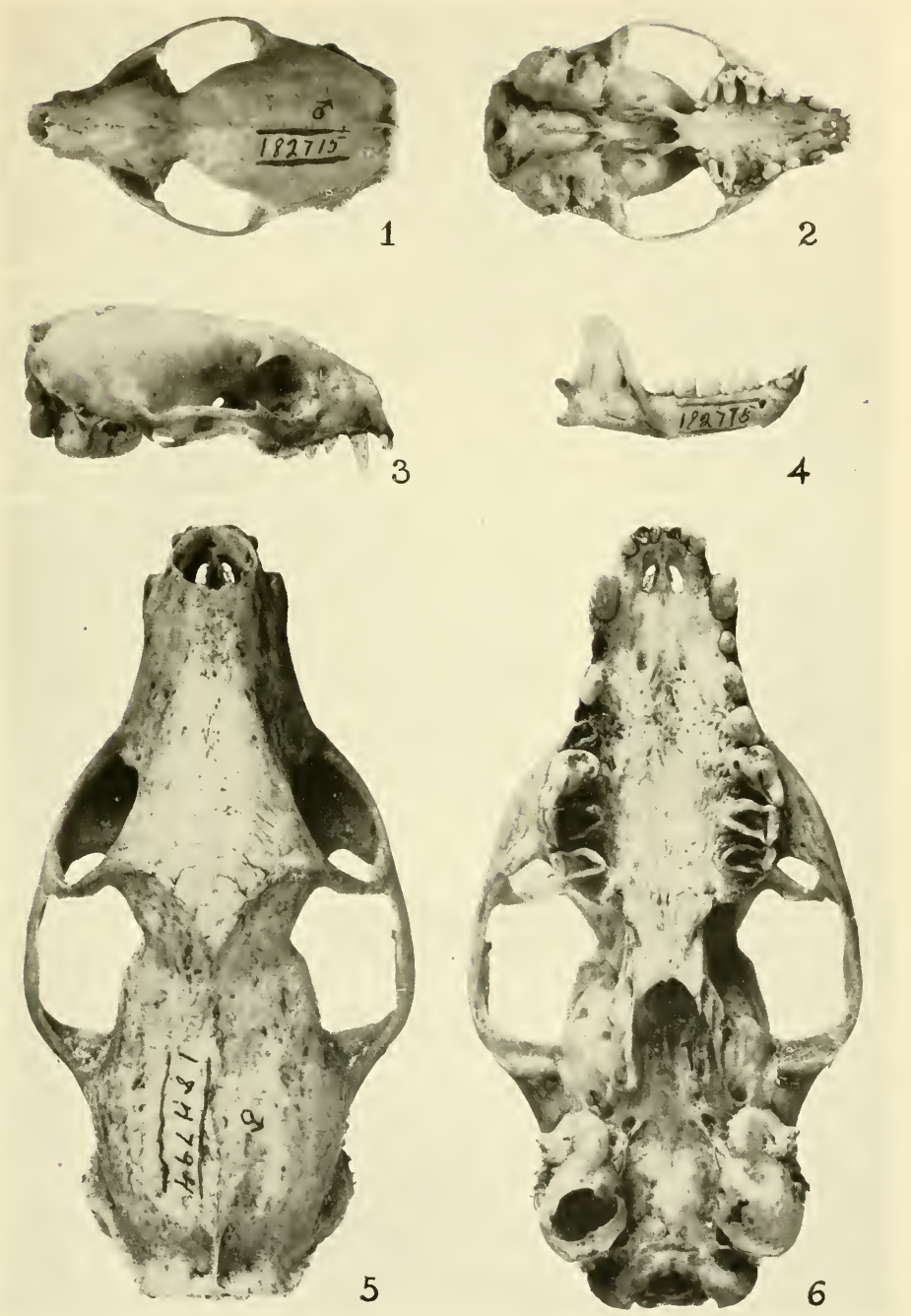

UPPER, BDEOGALE CRASSICAUDA OMNIVORA HELLER; LOWER, ATILAX PALUDINOSUS RUBESCENS (HOLLISTER). TYPES, NATURAL SIZE.

FOR EXPLANATION OF PLATE SEE PAGE 184.




MUNGOS ALBICAUDUS FEROX HELLER. TYPE, NATURAL SIZE.

FOR EXPLANATION OF PLATE SEE PAGE 184.




FIGS. 1–4, HELOGALE UNDULATA AFFINIS HOLLISTER; 5–6, ICHNEUMIA ALBICAUDA DIALEUCOS (HOLLISTER). TYPES, NATURAL SIZE.

FOR EXPLANATION OF PLATE SEE PAGE 184.

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FIGS. 1–2, CROSSARCHUS FASCIATUS COLONUS HELLER; 3, PROTELES CRISTATUS TERMES HELLER. TYPES, NATURAL SIZE.

FOR EXPLANATION OF PLATE SEE PAGE 184.

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FIGS. 1–2, CROSSARCHUS FASCIATUS COLONUS HELLER; 3, PROTELES CRISTATUS TERMES HELLER. TYPES, NATURAL SIZE.

FOR EXPLANATION OF PLATE SEE PAGE 184.

CROCUTA CROCUTA FISI HELLER. TYPE, ONE-HALF NATURAL SIZE.

FOR EXPLANATION OF PLATE SEE PAGE 184.

CROCUTA CROCUTA FISI HELLER. TYPE, ONE-HALF NATURAL SIZE.

FOR EXPLANATION OF PLATE SEE PAGE 184.

ACINONYX JUBATUS RAINEYI HELLER. TYPE, ONE-HALF NATURAL SIZE.

FOR EXPLANATION OF PLATE SEE PAGE 184.

ACINONYX JUBATUS VELOX HELLER. TYPE. ONE-HALF NATURAL SIZE.

FOR EXPLANATION OF PLATE SEE PAGE 184.

FELIS LEO ROOSEVELTI HELLER. TYPE, ONE-THIRD NATURAL SIZE.

FOR EXPLANATION OF PLATE SEE PAGE 184.

FELIS PARDUS CHUI HELLER. TYPE, ONE-HALF NATURAL SIZE.

FOR EXPLANATION OF PLATE SEE PAGE 184.

FELIS PARDUS CHUI HELLER. TYPE, ONE-HALF NATURAL SIZE.

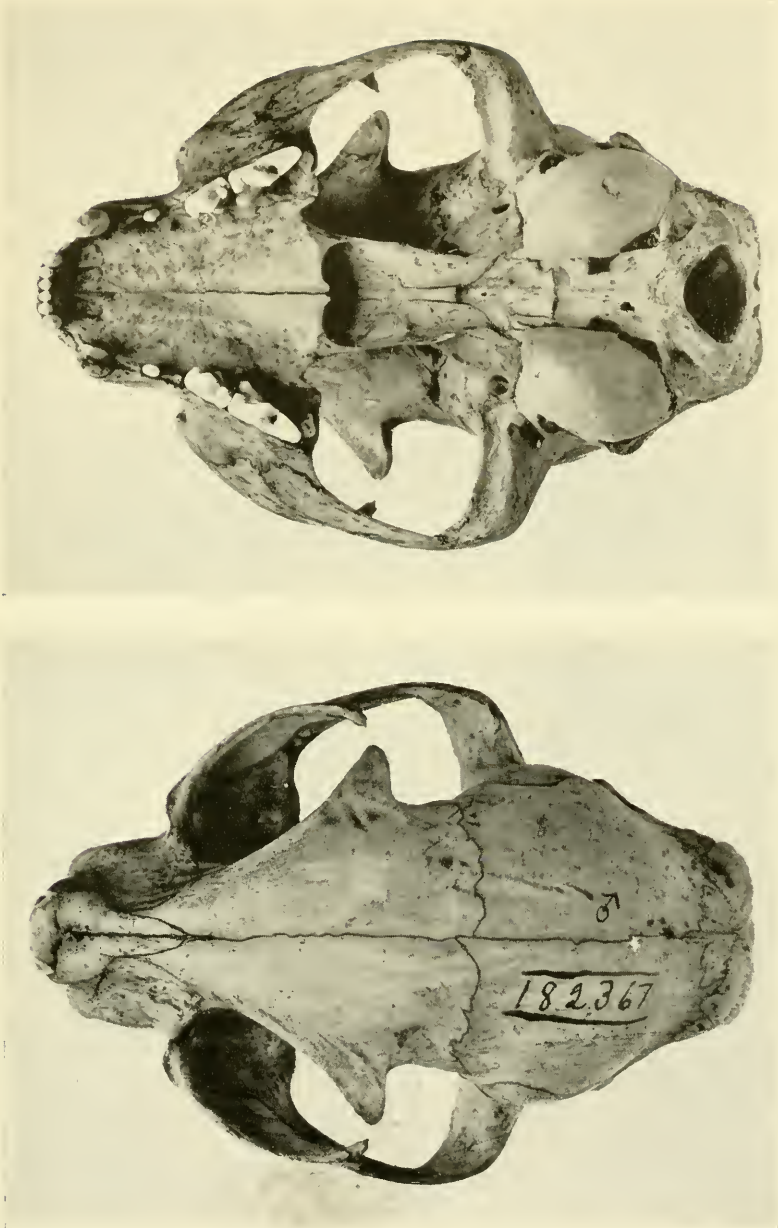
FOR EXPLANATION OF PLATE SEE PAGE 184.

FELIS FORTIS HELLER. TYPE, ONE-HALF NATURAL SIZE.

FOR EXPLANATION OF PLATE SEE PAGE 185.

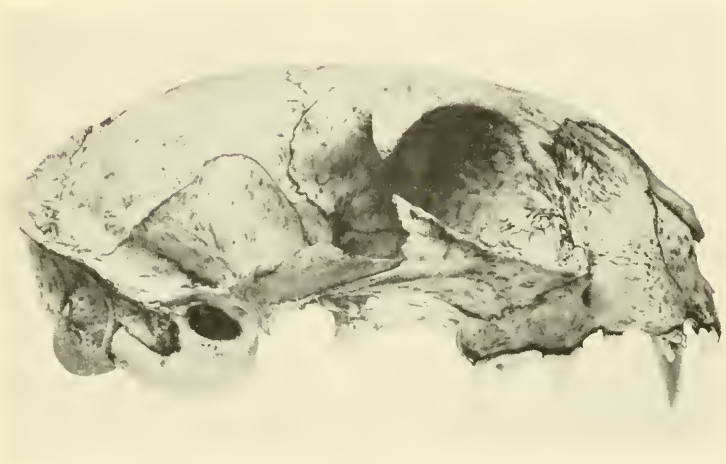
FELIS FORTIS HELLER. TYPE, ONE-HALF NATURAL SIZE.

FOR EXPLANATION OF PLATE SEE PAGE 185




FELIS OCREATA NANDAE HELLER. TYPE, NATURAL SIZE.

FOR EXPLANATION OF PLATE SEE PAGE 185.



FELIS OCREATA NANDAE HELLER. TYPE, NATURAL SIZE.

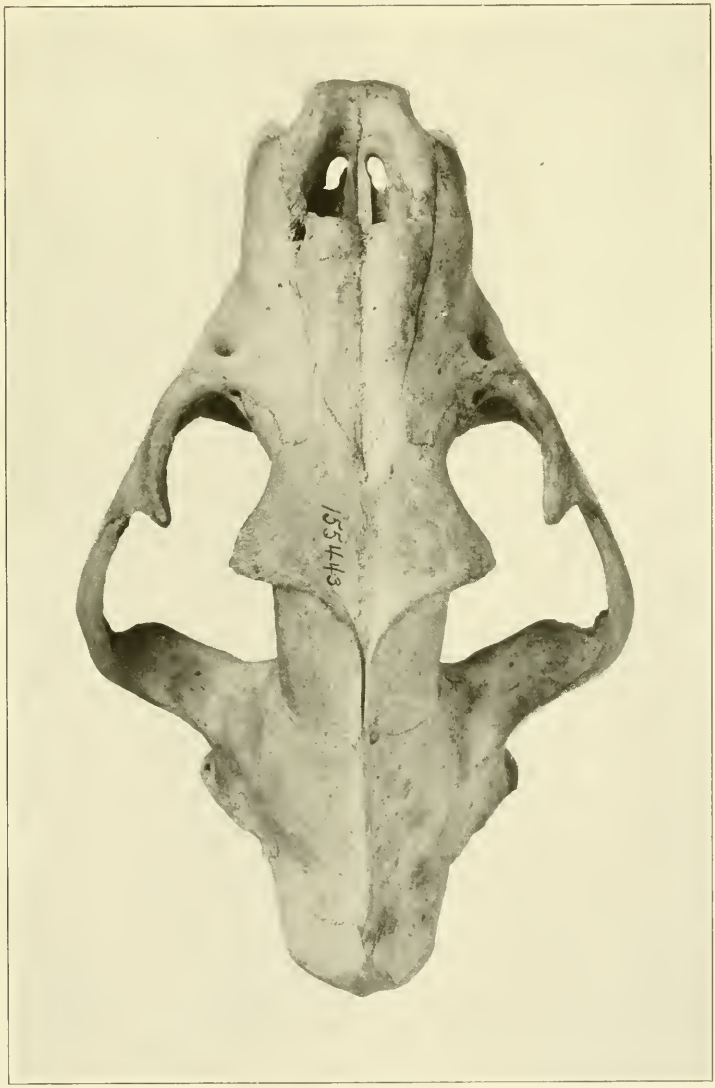
FOR EXPLANATION OF PLATE SEE PAGE 183.

FELIS OCREATA TAITAE HELLER. TYPE, NATURAL SIZE.

FOR EXPLANATION OF PLATE SEE PAGE 185.

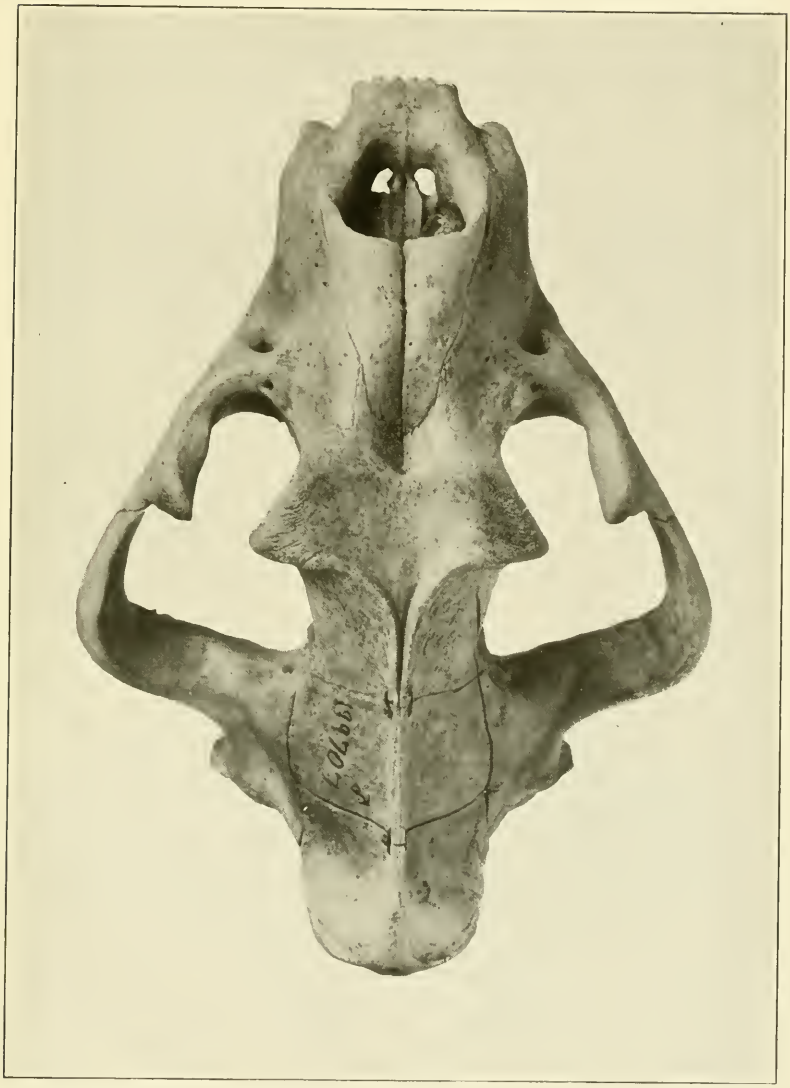
FELIS OCREATA TAITAE HELLER. TYPE, NATURAL SIZE.

FOR EXPLANATION OF PLATE SEE PAGE 185.




SKULL OF WILD-KILLED ADULT MALE FELIS LEO MASSAICA.

FOR EXPLANATION OF PLATE SEE PAGE 185.

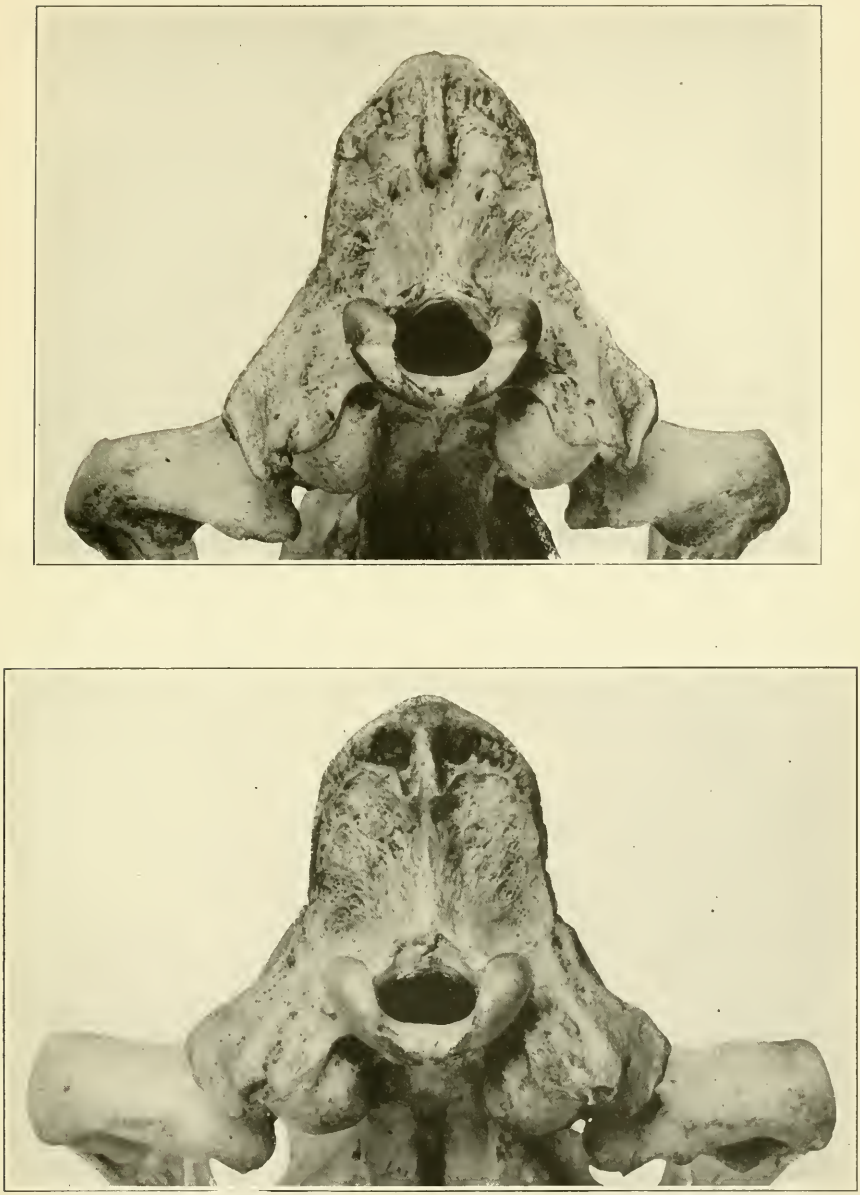


SKULL OF PARK-REARED ADULT MALE FELIS LEO MASSAICA.

FOR EXPLANATION OF PLATE SEE PAGE 185

SKULLS OF PARK-REARED (UPPER) AND WILD-KILLED (LOWER) LIONESSES.

FOR EXPLANATION OF PLATE SEE PAGE 185.



SKULLS OF WILD-KILLED (UPPER) AND PARK-REARED (LOWER) LIONS.

FOR EXPLANATION OF PLATE SEE PAGE 185.

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